SCIENTIFIC AMERICAN

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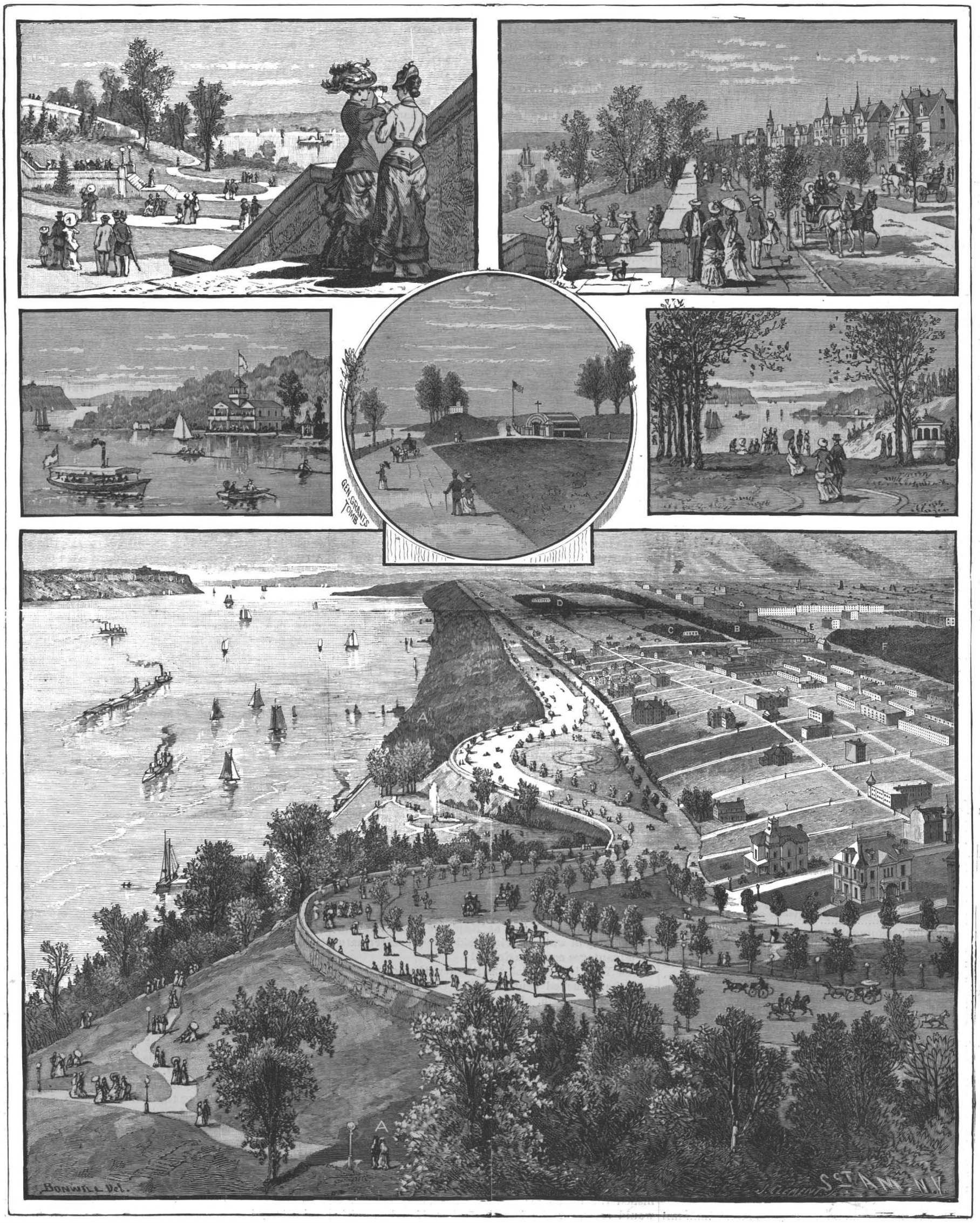

A. Riverside Park. B. Morningside Park. C. Cathedral site. D. Bloomingdale Asylum. E. Elevated railway. F. Northerly end of Central Park. G. General Grant's tomb.

NEW YORK.—THE SITE OF THE WORLD'S FAIR OF 1892.—[See page 39.]

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NEW YORK AS A SITE FOR THE WORLD'S FAIR.

A recent number of *Engineering*, of London, contains a racy article, by its New York correspondent, upon the comparative merits of New York and Chicago as locations for the great fair of 1892. Our limited space compels us to confine our abstract to a few of the points presented in favor of this metropolis, as follows:

"When the writer was asked to give reasons why the world's fair should be held in New York City in 1892, his first impulse was to decline on the ground, well known to beginners in mathematics, that "an axiom was a self-evident proposition." One might as well ask why London was the clearing house of the world, and the answer would be couched very much in terms of the proposition that a draft on London was negotiable everywhere. But the reflection that all English-speaking people are not perhaps as familiar with the reasons so plain to Americans has led to this article.

New York has, up to the present time, raised with very little effort $5,200,000. This has been done simply by sending around subscription books handed to the proper persons with no remarks by the solicitor. If a party subscribed $100 he was not asked to make it $200. The subscriptions have appeared in the daily papers and are all *bona fide*.

New York City has a population of 1,600,000. Brooklyn, connected with it by the East River bridge, numbers 900,000; Jersey City and Hoboken, on the opposite banks of the Hudson River, contain 300,000; while but 9 miles distant is Newark, N. J., with a population of 200,000. Moreover, within a radius of 25 miles around New York, not counting any of these places named, are many suburban towns, numbering in their population hundreds of thousands. Take, for example, 3 miles from Newark are the Oranges, with over 30,000, and all along the Hudson River are towns of similar numbers, for New York lies in the midst of a thickly settled district.

Eighty miles from New York is Philadelphia with a population of 1,200,000, and 75 miles the other side is New Haven. Boston is 225 miles, Baltimore 170 miles, and Washington 215 miles, not to name numerous large cities lying between, such as Providence, R. I., Springfield, Mass., Trenton, N. J., and many others. So that the immediate section lying around New York, from which it has largely to draw upon for its visitors, is thickly populated.

New York is situate on the Atlantic Ocean, and is the seaport of the United States. Many of the places named are accessible by water. The shores of the Hudson and of Long Island, and the Sound of New Jersey are dotted with towns and teeming with inhabitants, while the location of the fair is such as to be readily reached by boat. Many boats will be run at short intervals from all places within a suitable distance, and from other places there is no doubt that boats with staterooms will be plying, so as to furnish sleeping accommodation for their patrons in transit.

A party of Cook's tourists start from Liverpool to see the fair and the metropolis of the United States, for a round trip, with a limited ticket, and having but a short time at their disposal. On reaching New York their steamer goes to the fair wharf and drops anchor in a convenient place. After seeing the fair they return to their steamer and live on board, without bother of transfer of baggage or any of the annoyances of an hotel. The nights, even in the hottest months, are cooled by the breezes of the Atlantic, and they return home in equal comfort.

As to the site chosen, New York has selected a beautiful one, easy of access, with fine views of the bay and sound, and in every respect an ideal and picturesque location.

New York is perhaps the most attractively located city in the world. Situated on an island with rocky scenery on the New York side, and hills on the Long Island, at the head of a bay which is said by many to equal the celebrated one at Naples, and with an immense body of water on either side, what greater natural advantages could be desired?

New York is the social, the literary, the commercial, and the moneyed center of the United States, and there it will remain. Here is where all nations flock, and it must be so, as long as the channels of trade run in this direction. Naturally, the brains of a country find support at its mercantile center, and they will just as naturally gather there."

TORPEDO BOAT TESTS.

The tests of the eight new first-class torpedo gun boats recently built for the British navy show that, even at this late day, such designing is only in its experimental stage, and that, though the maximum weight of structure to buoyancy is readily determined, the point beyond which power for driving may not be increased remains unsettled. The Rattlesnake furnished the model for these craft. Wisely chosen, it would seem, for she has shown herself to be a fairly good sea boat, a rare quality among her type, and, yet a rarer one, has sides heavy enough to warrant the belief that she could withstand any ordinary attack. But she is not speedy, that is to say, not sufficiently so for a craft which, because of the very nature of her work, might be greatly exposed. It was sought to combine in the new boats all her best qualities and the additional one of high speed. Though only of 735 tons, they were fitted with engines of the relatively enormous horse power of 4,500. Even the Sea Gull, which seems to be, all things considered, the staunchest of the lot, could not stand anything like the full development of her engines under forced draught.

At the trials at Portsmouth, with engines showing an energy of 3,033 horse power, the vibration was terrific, bolts starting and the seams on the deck fluting opening. After a trial of scarce two hours, only a portion of the time with engines indicating 3,000 horse power, it was decided unsafe to continue. Just before the order to stop was given, the main air pressure in the stoke hold was 2·3 inches, mean revolutions 245, and mean speed close upon 20 knots. The boilers—they are of the locomotive type—were found to be leaking, and the hull incapable of enduring the strain of forced draught.

As a proof of the impracticability of the plans, none of the contractors—there were seven of them—succeeded in producing a craft able to meet the expectations of the naval designers. It may be said for these vessels, however, that though not "improved" Rattlesnakes, as was intended they should be, they showed themselves, with one exception, to be good sea boats, that is to say, as good as short, heavy gun boats could fairly be expected to prove. But, under normal draught, they did not do better than 17 knots, which the Rattlesnake, under so much forced draught as she is capable of enduring, can beat.

NOTES.

Shipbuilding on the Maine coast was more active during the past year than it has been since the palmy days before the war, when the fleet had the pick of the carrying trade. Yards which for years scarcely paid expenses are doing a thriving business, and others for long deserted echo with strokes of adz and caulking mallet. Three-masted schooners of enormous size have been built in large numbers, four-masters, too, and now and again a noble five-master leaves the shores and blocks, and glides out into the open sea. It is not so long ago that a 1,000 ton schooner was considered enormous. Now, a 1,500 tonner is scarcely remarked. They are built up to 1,700 tons, and the keel of one which is to measure 1,800 tons was laid some time since at Bath. The advantage of the fore-and-aft rig is that it can be handled by a small force, the aid of steam winches being, of course, required to set the sails. All these big craft carry steam engines, used not only for hoisting sail and cargo, but as well for pumping and setting anchors. The Maine tonnage for 1889 was: Bangor, 401; Bath, 24,586·89; Belfast, 4,599 66; Castine, 114·41; Frenchman's Bay, 50·05; Machias, 3,861·34; Portland, 1,296 05; Waldoboro, 3,482·00; York, 99; Total, 39,548·04. The outlook for this year is still more encouraging.

A French engineer, in a recently published pamphlet, suggests a permanent flooding of the interior of the Isthmus of Panama as a means of solving the canal project that M. De Lesseps and his company have had such ill success with. M. Sautereau, whose idea it is, would dam the River Chagres at a point about fifteen miles from Colon, the Atlantic terminus, building a high level lock there and another on the Pacific side, where the River Grande would be similarly dammed. Thus, with both ends of the canal already fairly completed, and a great artificial lake lying between, only one obstacle, Culebra, would remain to be dealt with. This he would cut through at the floating line.

Whoever may have seen the Chagres in its wild moods, when, swelled by mountain torrents, it floods forty square miles of its valley, sometimes to a depth of sixteen feet, or has seen the furious inrush of the waters of the Caribbean Sea, will wonder at the temerity of the engineer who could suggest such a scheme. Even he seems not altogether satisfied of the practicability of building locks 88 feet in height. Yet smaller ones would not suffice.

The claim a wholesale grocery house of St. Louis recently made against the South Shore Railroad brought to light the fact that, at least in some quarters, dirt under the name of terra alba is being used in candy to an almost incredible extent. It was a half dozen barrels of lozenges made by a Boston house that had been shipped, the claim being that they had been damaged in transit. The railroad company sent samples of the lozenges to a chemist, who discovered them to consist "entirely of terra alba bound together with a little gelatine or gum." Investigation showed them to yet require dipping in sirups flavored with peppermint, wintergreen, sassafras, and the like, before being ready for infantile consumption. Now, terra alba is a mineral utterly insoluble in the saliva or gastric juice—a dangerous compound to put within even a healthy stomach; and when the railroad company learned this they refused pay any damages, and the grocery house,

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fearing exposure, ceased to press the claim. The *Board of Trade Journal* of Portland, Me., says that 6,000 tons of terra alba were recently imported though the port of New York alone.

A company has been incorporated under the laws of Virginia to build railroads in South America and steamer lines to connect the same with United States ports. The project, as described by its promoters, is "to construct a line of railroad from some point near the mouth of the Magdalena River, which empties into the Caribbean Sea, in the United States of Colombia, southwardly along the eastern flank of the Andes and the headwaters of the Amazon to points in Peru, thence to connect with the Peruvian and Argentinian system of railroads, at present in operation or under construction. From the mouth of the Magdalena River steamships will be run to the southern point of Florida and to New Orleans, whence will extend railroad connections to our own chain of railroads."

Both the Anglo-American and the Bennett-Mackay cable companies are beginning to deliver messages in typewriting, the operators taking them from the lines directly upon the typewriter.

Electrical.

1. How strong a current is used to send a message over an Atlantic cable? A. Thirty cells of battery only, equal to thirty volts.

2. What is the longest distance over which conversation by telephone is daily maintained? A. About 750 miles, from Portland, Maine, to Buffalo, New York.

3. What is the fastest time made by an electric railway? A. A mile a minute, by a small experimental car. Twenty miles an hour on street railway system.

4. How many miles of submarine cable are there in operation? A. Over 100,000 miles, or enough to girdle the earth four times.

5. What is the maximum power generated by an electric motor? A. Seventy-five horse power. Experiments indicate that 100 horse power will soon be reached.

6. How is a break in a submarine cable located? A. By measuring the electricity needed to charge the remaining unbroken part.

7. How many miles of telegraph wire in operation in the United States? A. Over a million, or enough to encircle the globe forty times.

8. How many messages can be transmitted over a wire at one time? A. Four, by the quadruplex system, in daily use.

9. How is telegraphing from a moving train accomplished? A. Through a circuit from the car roof, inducing a current in the wire on poles along the track.

10. What are the most widely separated points between which it is possible to send a telegram? A. British Columbia and New Zealand, *via* America and Europe.

11. How many miles of telephone wire in operation in the United States? A. More than 170,000, over which 1,055,000 messages are sent daily.

12. What is the greatest candle power of arc light used in a lighthouse? A. Two million, in the lighthouse at Houstholm, Denmark.

13. How many persons in the United States are engaged in business depending solely on electricity? A. Estimated 250,000.

14. How long does it take to transport a message from San Francisco to Hong Kong? A. About fifteen minutes, *via* New York, Canso, Penzance, Aden, Bombay, Madras, Penang, and Singapore.

15. What is the fastest time made by an operator sending messages by the Morse system? A. About forty-two words a minute.

16. How many telephones are in use in the United States? A. About 300,000.

17. What war vessel has the most complete electrical plant? A. United States man-of-war Chicago.

18. What is the average cost per mile of a transatlantic submarine cable? A. About $1,000.

19. How many miles of electric railway are there in operation in the United States? A. About 400 miles, and much more under construction.

20. What strength of current is dangerous to human life? A. Five hundred volts, but depending largely on physical conditions.—*Age of Steel.*

Frog Farming.

A new industry has sprung up latterly, which promises, we are told, profitable results. It is frog raising. A farm for this purpose at Menasha, Wis., is in full operation and stocked with 2,000 females, which are capable of producing from 600 to 1,000 eggs at a time. The owner of the farm gives some other interesting facts relative to the frog's habits which are not generally known. He says:

In ninety-one days the eggs hatch. The thirty-ninth day the little animals begin to have motion. In a few days they assume the tadpole form. When ninety-two days old, two small feet are seen beginning to sprout near the tail, and the head appears to be separate from the body. In five days after this they refuse all vegetable food. Soon thereafter the animal assumes a perfect form. Next spring 25,000, at 20 cents per dozen, will be my reward. Figure it yourself, says the enthusiastic frog farmer, and see if there is any money in batrachia, *alias* frogs.

A Modified Westminster Abbey for Washington.

In the Senate, recently, Mr. Dolph offered the following resolution:

Resolved, That the Committee on the Library be directed to inquire into the advisability of the erection by the government of the United States, at the city of Washington, of a memorial hall, at which shall be received and preserved such statues and portraits of public men and eminent citizens of the United States and such historic paintings and other works of art as may be provided by law; and to report by bill or otherwise.

"I have offered this resolution," said the senator, "for the purpose of directing the attention of the Committee on the Library to the subject covered by it. It seems to me that a moment's reflection will satisfy any one that the erection of such a hall by the government at the capital and the making of such a collection of statues and portraits is not only appropriate, but is important. Suppose at the beginning of this government, a century ago, such provision had been made and there had been collected the portraits of the men who signed the Declaration of Independence, or of those who composed the Constitutional Convention, of the fathers of the country, those members of the cabinet and of the Senate and of the supreme bench who laid the foundations of our present greatness, what an object of interest it would be to the hundreds of thousands of citizens who visit the capital every year; and I see no reason to believe, if such provision should be now made, if we should now enter upon this work, that one hundred years hence such a collection might not be of equal interest.

"But there is another view of this subject which ought to be taken into consideration. We already need such a hall for the collection we have. The hall in this capitol which is devoted to the reception of statues of eminent men from the States is already filled, and when the States not already represented there shall have exercised their privilege of sending to it statues of their eminent citizens, it will be overcrowded; and the room is already needed for other purposes.

"Then, the portraits of the presidents of the United States are becoming so numerous that they cannot be hung to advantage in the presidential mansion, and if the practice of securing the portraits of the heads of departments shall continue, as it probably will, those in charge of the department buildings will not know what to do with them.

"So, I say such a hall is already needed. England has her Westminster; other nations have their edifices where their citizens can make pilgrimages to the tombs of their poets and philosophers and lawyers and statesmen and kings, or can look upon their likenesses chiseled in enduring marble or painted by eminent artists upon canvas. Let the United States have a hall, not for burial purposes, but where the pilgrims to the national capital in coming generations may look upon the forms or pictures of the eminent men of the republic, whom a great and free people delight to honor on account of their patriotic services to the country."

Proper Care of Carriages.

There is no varnish made that will hold its brilliancy more than six months. A carriage should be revarnished every six months to keep it exactly in fine order. If revarnished once a year, it will preserve the undercoats from damage. But there are circumstances that render revarnishing necessary at more frequent intervals. If one has not a suitable carriage house separate from the stable, the ammonia from the stalls or the manure pile, or perhaps from decaying vegetables, has united with the oil in the varnish and gradually dissolved it or burnt it. We have known it done in one night, so that the whole surface exposed to the ammonia was shriveled up in small brown, crisp rolls. We knew a case where a gentleman left his horse and buggy standing in front of a distillery for half an hour, and when he returned one side of his buggy was completely covered with what looked like rust, but which was simply the remains of the decayed varnish. The oil had been consumed, leaving only the gum crumbled up in burnt crisp flakes. Some people do not take the pains to wash the mud from a carriage soon enough after using, but permit it to dry, when the mud acts like a sponge and absorbs the oil from the varnish. Some people wash the carriage with soap, and we have even known hot water used. For such acts of stupidity there are no words to express disgust. Some people seem to regard varnish as a kind of high polish, put on by hard rubbing, and the more rubbing it gets the brighter it ought to look. The number of people who are absolutely ignorant about varnish is something astonishing.—*The Stable.*

PHOTOGRAPHIC NOTES.

Gelatine Lantern Slides.—For architecture, plans, diagrams, engravings or part of an engraving, a rough and ready way of preparing a transparency for the lantern is as follows:

Procure a sheet of colorless gelatine about the substance of thick writing paper, and place it directly over the subject to be copied. Fix the corners with drawing pins to prevent any slipping, and then go over all the lines with a sharp-pointed tracer. A large needle fixed in a wooden handle will do, but the point should be lightly ground on a stone to take off the polish. Now take a small quantity of black lead or lamp black on the tip of the finger and rub over the tracing, and you will then have an exact copy of the original. It may, if necessary, be colored with moist water colors, using the transparent ones only. The gelatine should be then mounted between two glass plates.

By coating a piece of glass with dissolved gelatine the same effects may be obtained, but the subject to be copied and the surface to be traced being a greater distance apart, you may not get so truthful a transcript. Instead of using a tracing needle a copying ink pencil will answer, or a very fine-pointed pen, with Indian ink or lamp black (water color), strong in pigment. This last is perhaps the most satisfactory as regards intensity.—*Joseph Phillips in The Optical Magic Lantern Journal and Photographic Enlarger.*

A New Toning Bath for Gelatino-Chloride Printing-out Paper.—Herr A. Stieglitz recommends, in Liesegang's "Amateur Photograph," the following toning bath for aristo paper, giving quickly beautiful blackish tones:

Chloride of gold	0·25 gramme.
Nitrate of uranium	0·25 "
Bicarbonate of soda	5 grammes.
Distilled water	300 c. c.

The bath should be used at once, because it does not keep. The pictures should be printed very deeply, and before toning they should be washed in at least six changes of water. Fixing is done in

Hyposulphite of soda	1 part.
Water	5 parts.
Ammonia	several drops.

The prints will be toned within two minutes.

Photomicrography.—At present, according to Dr. Zettnow, green sensitized erythrosin plates are used for photomicrography, a green colored screen being inserted between illuminant and microscope. Dr. Zettnow uses erythrosin plates and a solution of

Nitrate of copper	160 grammes.
Chromic acid	14 c. c.
Water to make up	250 "

With this solution a plane parallel glass vessel, with about one-half inch distance of the glass sides, is filled. Professor Eder uses eoside of silver plates for the same purpose. These are prepared by soaking ordinary gelatino-bromide plates for two minutes in the following solution:

Solution of crystallized eosin (1 : 1000)	25 c. c.
Solution of nitrate of silver (1 : 80)	1 "
Ammonia	1 to 2 "
Water	75 "

The green colored screen consists of a mixture of indigo, sulphuric acid, and picric acid, the development being by preference carried out with the well known mixture of pyrogallic acid and soda. The erythroside of silver is prepared by Dr. Zettnow as follows: 1 gramme of the coloring matter is dissolved in 200 c. c. of water, the solution heated up to 60° or 80° C., and then is added a solution of 1 gramme of silver nitrate in 10 c. c. of water. The precipitate is allowed to settle, and, after cooling, the solution is filtered. The washing of the precipitate on the filter is continued until the filtered liquid appears colorless. Then the filter is pierced, the precipitate being sputtered off and so much diluted with water that its volume amounts to 250 c. c.; 1 c. c. of the well shaken liquid, in which the finely divided silver compound has been evenly swelled, being therefore equal to 4 milligrammes of the originally taken coloring matter.

An Excellent Gold Bath for Albumenized Paper.—The following toning bath is recommended by E. Kiewning, an experienced professional photographer, as absolutely certain, giving brown to bluish tones, according to the degree of its concentration and the time the prints are allowed to remain in it:

Water	600 c. c.
Chloride of gold	4 grammes.
Potassium chloride	60 "

This having been made up, add

Shaved, chem. pure chalk (carbonate of lime)	20 "

The mixture is allowed to ripen for three or four days in the dark, and with occasional shaking; it is then ready for use. To tone one sheet of albumen paper, 19 c. c. of this solution are diluted with 200 c. c. of water. If it is desirable to tone quicker, only 150 c. c. of water are added. The bath tones well and evenly to the last drop, especially in summer at high temperature, where the use of carbonate of soda in the gold bath seems not to be recommendable on account of its rapid decomposition. The above toning bath will prove to be very useful.—*H. E. Gunther in Photo. News.*

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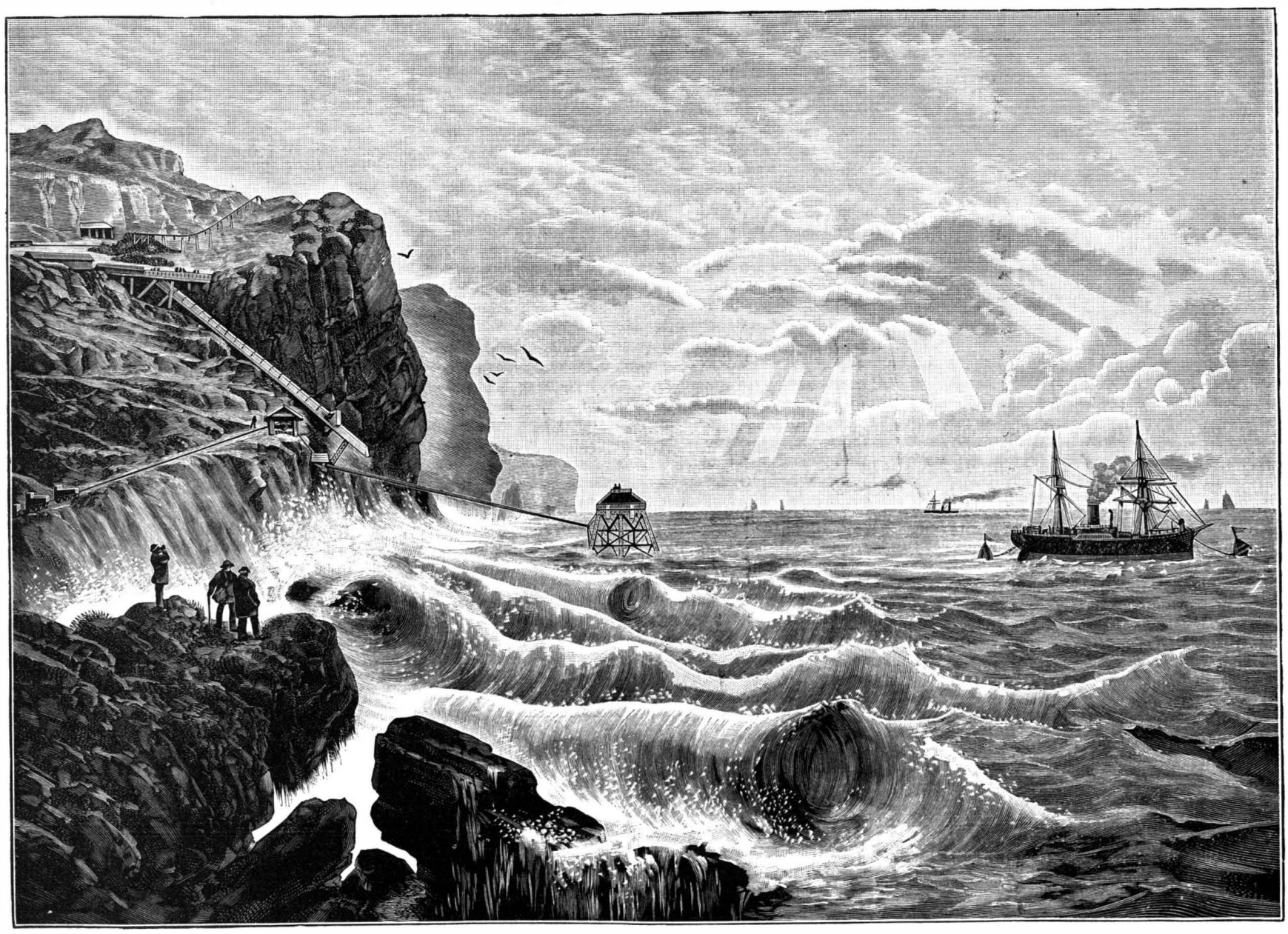
THE SUBMERGED RAILWAY OF ONTON ON THE COAST OF SPAIN.

The mines of Onton, near Bilbao, north Spain, have long been celebrated for their richness in the yield of iron ores suitable for the manufacture of steel, but great trouble has heretofore been experienced in the shipment of the mineral on account of the difficulty of placing it on board of the ships. England and the Continent are the great markets for this product. The coast adjacent to these mines is high and rocky, exposed to the full force of the sea, there being no harbors in the immediate vicinity. At the foot of the rocks there is a sloping shore which extends out to a considerable distance, with an even grade. It is upon this incline that the remarkable railway we are about to describe has been constructed.

The roadbed of the railway has a length of about 650 feet and a width of 20 feet, upon which two sets of parallel tracks, each 3¼ feet wide, are placed, constituting a four-rail railway. The grade is five feet to the hundred. The car which traverses this railway, and upon which the ore is conveyed from the cliffs to the ships, consists of a high metallic tower made in the form of a pyramid having a wide triangular base. The tower is mounted on wheels, which run upon the quadruple railway track before mentioned. The platform of the tower, upon which the load of mineral is placed, is about 70 feet high from the track, a height which is sufficient to rise above the decks of ordinary vessels when the tower is run alongside thereof; and from the platform the discharge of the ore is made directly into the holds of the vessels. This great rolling tower is operated automatically. It is connected to the shore by means of a strong wire cable, which passes over pulleys fastened to the rocks. At the landward end of the cable there are attached some weighted cars that move up and down upon an incline, as shown in our engraving. These form a counterbalancing weight for pulling the tower when empty in toward the shore.

The mineral to be loaded upon the vessels is brought from the mines, which are not far distant from the coast, upon rope railways mounted upon posts, as seen in our engraving. From the mineral dumps upon the rocky heights the mineral is conveyed part way down the cliff through a chute, the end of which projects beyond the cliff, and when the empty tower is drawn to shore by the weighted cars before mentioned, it automatically opens an end gate in the chute and allows the mineral to drop upon the platform in a continuous stream until a weight of ore sufficient to overcome that of the counterbalancing weight or weighted cars has fallen upon the platform; and when this takes place, the tower, by its own gravity, begins to move down the inclined railway, and the gate of the chute automatically closes. The tower continues to glide down the inclined railway through the water, until it reaches the side of the ship, which is anchored fore and aft, and then by the throw of a lever, the platform of the tower being inclined, the whole load upon the platform is almost instantly deposited upon the ship, going down through suitable slides into the hold thereof. As soon as the discharge of the load takes place, the counterbalancing cars begin to draw the tower inward again toward the shore, and thus the operation of moving the tower back and forth automatically, and automatically loading and discharging itself, is carried on with the greatest success.

It is said this railway operates even when the sea is extremely rough. It certainly is a bold undertaking, and reflects the greatest credit upon its constructor, Mr. D. M. Alberto de Palacio. The platform carries for its load one hundred tons of ore. It is said that 5,000 tons of ore per day can be put on shipboard by means of this apparatus, the total cost of which was only $18,000.



THE SUBMERGED RAILWAY OF ONTON, ON THE COAST OF SPAIN.

We are indebted for our engraving to *La Ilustracion Espanola.*

Curious Tablets in Clay.

Professor Sayce, lecturing at Manchester recently, said a marvelous discovery had lately been made in Egypt. They had been suddenly brought face to face with the civilized world as it existed in the days when the Israelites were groaning under the burdens of their Egyptian taskmasters. They could handle the very letters that were written by the princes and governors of Canaan when as yet Joshua was unborn, and they could trace the course of events that led to the mission of Moses and the exodus of Israel out of Egypt. On the eastern banks of the Nile was a big line of mounds, known to the natives under the name of Tel-el-Amarna. About two years ago some natives, while going on with their work of disinterment, discovered among the foundations a number of clay tablets covered with characters the like of which had not previously been seen in the land of Egypt. He was able to see some that were half obliterated, and found that they consisted of letters and dispatches written in Babylonian characters and in the language of Babylon. Some of the letters showed that they must have been written about 1430 B.C., or about a hundred years earlier than the date assigned by Egyptologists to the Exodus. It was sufficiently startling to learn that at this early period of history the chief sovereigns of the civilized world, separated though they were from one another by vast tracts of country, were nevertheless carrying on an active correspondence. But a greater surprise was yet to come. Not only did the kings of Assyria and Babylonia correspond with the Egyptian monarch in the language and writing of their own country, but continuous literary intercourse in the same language and writing was being carried on throughout the whole length and breadth of Western Asia; in short, the whole civilized world of the past was as closely knit together in literary intercourse as they were in these modern days of the penny post. Nothing could happen in the distant world or far Orient without its being immediately communicated to the Egyptian court.

Corrosion.

The purest water often is the most active in corroding and pitting plates, and this makes it probable that the active substance, in some cases at least, is air. It is well known that water is capable of dissolving a considerable amount of air, in fact, it is this dissolved air that enables fish to breathe. It is not so widely known, however, that the oxygen of the air is more soluble than the nitrogen. If a small quantity of water be shaken up in a bottle, it dissolves some of the inclosed air, and when this is afterward driven off by boiling, and analyzed, it is found to consist of oxygen and nitrogen in the proportion of 1 to 1·87, instead of 1 to 4, as in the natural air. Thus the dissolved air, being more than twice as rich in oxygen as common air is, and being brought into more intimate contact with the metal by means of the water that holds it in solution, exerts a correspondingly more noticeable effect. It is probable, too, that water plays some other important action in connection with the oxidation of metals, for it has been found by recent experiments that pure oxygen will not combine with things that it has the greatest affinity for, provided it is perfectly dry. Even the metal sodium, which has an intense affinity for oxygen, may be heated in it to a very high temperature without combination, provided sufficient precautions are taken to exclude the slightest trace of moisture. It appears, therefore, that water plays a most important part in the oxidation of metals by air—a part, indeed, that we cannot explain, and that we really know but little about.—*The Locomotive.*

THE United States squadron, consisting of the war ships Chicago, Boston, Atlanta, and Yorktown, reached Lisbon recently, after a very satisfactory passage from Boston. They proved to be good sea boats and economical in fuel when run at moderate speed. From Lisbon the squadron goes up the Mediterranean.

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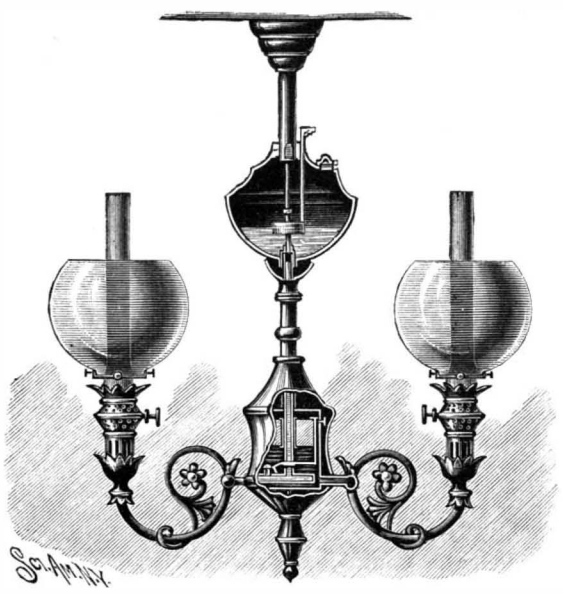
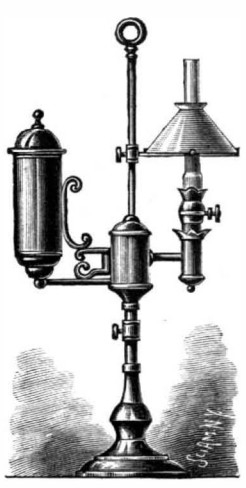
IMPROVED PORTABLE LAMP.

Father Di Marzo's portable lamp resembles the German student's lamp; but it is based on an entirely new principle. The former is actuated by pneumatic pressure, whereas Di Marzo's lamp is actuated by an automatic valve, which by itself opens and closes as the lamp is lighted or extinguished. This lamp dispenses with the sliding cylinder; it has an opening on the top of the oil chamber, and the oil is poured into it, the same as in an ordinary lamp; thus doing away with the inconvenience of having to pull out the cylinder, fill it, shut it, replace it, and open it to let the oil to the burner. The upper cut shows a suspension lamp; it has an elevated oil chamber in the shape of an ornamental vase, capable of containing from two to five gallons of oil.



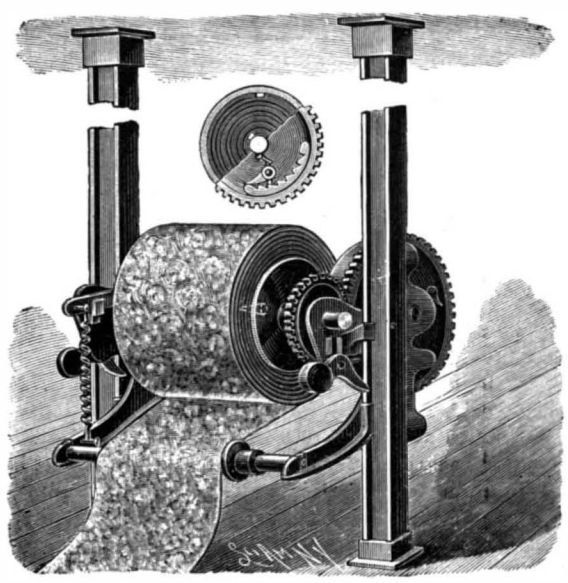
OIL LAMP CHANDELIER.



These lamps can be made with two, three, or any number of burners, and are susceptible of all the forms of gas chandeliers; their illuminating power varies from fifty to two thousand candle power. Owing to the immense proportions which central draught burners have obtained, this lamp is called upon to play a great role in the system of illumination. Heretofore, burners of large proportion presented an insurmountable barrier to their success, by the fact that, consuming a large quantity of oil, the level in the lamp soon lowered, and consequently the flame would lower also; but in this system, the oil is kept constantly near to the burner, and in measure as it is consumed by the flame it is immediately supplanted by a fresh supply. By this means the burner, no matter how large, will give always a brilliant light; but by far the most important advantage which this system offers is its safety. In most lamps, when the level of the oil is lowered, the metal or glass itself becomes a conductor of heat, which by its action transforms the oil into gas, and if there be no means of escape, when it has accumulated in sufficient quantity, it will break the vessel, and an explosion will follow. The small supply tube used in this system prevents this from occurring. For further particulars, address the patentee, Father Vincent di Marzo, Louisville, Ky.

AN IMPROVED CARPET EXHIBITOR.

A display rack for carpets, oil cloth, shade cloth, etc., in salesrooms, by means of which the material may be drawn from the roll as required for display or sale, and automatically rewound when desired, is illustrated herewith, and has been patented by Mr. Newton H. Traver, of No. 99 Pitcher Street, Detroit, Mich. The standards are preferably made in girder shape or of I-bars, with ratchet notches upon one face in the edges of their flanges, the standards being introduced at the base into short sockets secured to the floor, and into long sockets attached to the ceiling, whereby the standards may be readily adjusted to rooms of varying heights. Upon the flanges of each standard a bracket is held to slide, by means of lugs and a key, so that the brackets may be expeditiously and conveniently detached whenever desirable, while the brackets are locked to the standards at various points in the height of the latter by pawls which enter the notches in the standards. In the upper edges of the left hand bracket is a recess adapted for the reception of one end of a reel shaft, a spring-controlled lock lever acting as a brake to prevent the revolution of the reel shaft when not desired. Upon the reel shaft, between the brackets at the right hand end, is a spur wheel, and at each side of the center is an adjustably mounted disk, with pins on their inner faces, between which the roll of carpet, etc., is held, the pins entering between the folds. Upon a spindle secured to the inner face of the right hand bracket is loosely mounted a drum containing a coil spring, as shown in the small view, one end of the spring being attached to the spindle, aud the other end to the inner face of the drum. Upon the outer edge of the drum are teeth adapted to mesh with the spur wheel of the reel shaft, and upon the outer face of the drum is pivoted a pawl. Upon the inner face of a rear projection of the right hand bracket is formed an arc-shaped projection, the concave edge being upward, and having a series of ratchet teeth, with which the pawl of the drum containing the coiled spring contacts. The arrangement is such that the carpet may be drawn downward, and thus held in locked position as desired by the operation of pawls, or be drawn further and released, when it will be rewound by the action of the drum spring. To guide the carpet in rewinding, a guide shaft is journaled upon arms of the brackets, and provided with a movable sleeve. Two or more devices may be placed on each set of standards, one above the other, and when it is desired to unroll quite a length of material, the drum may be readily thrown out of gear with the reel shaft.



TRAVER'S CARPET EXHIBITOR.

Steamship Speed at Half Power.

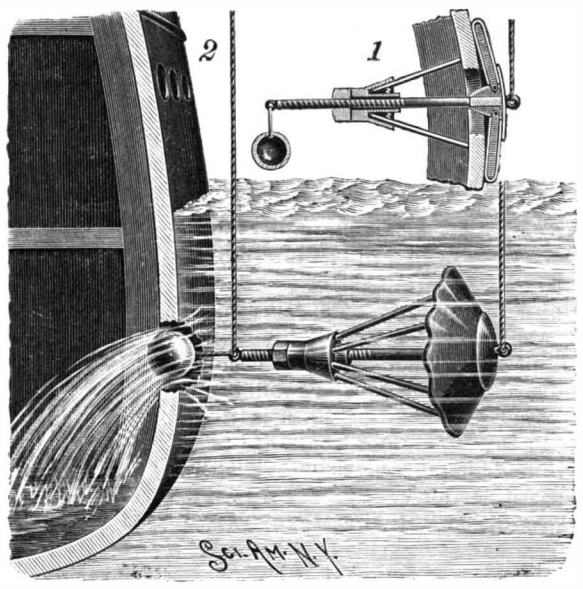
It has frequently been stated that a prominent advantage of twin screw steamers is their security against complete disablement in case one of the engines breaks down, added to the fact that with one engine the vessel can be propelled at about three-quarters of the usual speed. A good illustration of these statements has recently been furnished by the Inman steamer City of New York, which broke one of the crank pins of the port engine on her last eastward trip, and finished the voyage with her starboard engine. A comparison of the daily runs under these circumstances with three daily runs of the preceding eastward trip gives the following results:

	Daily runs—nautical miles. With both engines.	With one engine.	Ratio.
1	474	375	0·791
2	461	382	0·829
3	417	352	0·844
Total and averages	1,109	1,352	0·820

The above table further illustrates the enormous cost which the ocean racers must pay to produce their fine records and the comparatively slight increase in speed obtained by doubling the propelling power.

A LEAK STOPPER FOR VESSELS.

A device adapted for closing openings below the water line in the hull of a vessel, and specially fitted for closing such openings made by a shot, is shown in the accompanying illustration, and has been patented by Mr. William Winchester, Fig. 1 showing the device in section as applied on the hull of a vessel, and Fig. 2 showing it suspended before a break in the vessel. A head, consisting of two circular pieces of rubber or other flexible material, is attached to the outer end of a threaded shaft to form a spaced upper and lower wall, between which the outer ends of spaced ribs are secured, the free inner ends of the ribs being pivoted in a hub on the outer end of the shaft, the head thus partaking of the form of an umbrella with concealed ribs. At the outer end of the shaft is a plate to limit the outward spread of the head, and an eye to receive one end of a rope, there being also another eye for a rope at the inner end of the shaft, by means of which it is suspended in horizontal position. A sleeve is held to slide loosely upon the shaft, and in this sleeve are longitudinal recesses in which are pivoted the inner ends of stretcher bars, adapted to extend outward to within a suitable distance of the head, the stretcher bars being normally held partially extended by springs in the sleeve. A locknut is screwed upon the inner end of the shaft, to which also a float is attached by a short rope. When the shaft is lowered horizontally over the side of a vessel in proximity to a leak, the water passing through the opening draws the float into the hull, and the stretcher arms close upon the shaft sufficiently for them to pass in with it through the opening until the head is brought in contact with the outer surface of the hull, when the stretcher arms expand and engage with the inner surface of the hull. The inner suspension rope being then disengaged the lock nut is screwed forward from the inside of the vessel against the sleeve, drawing the head tightly against the outside of the hull around the opening.

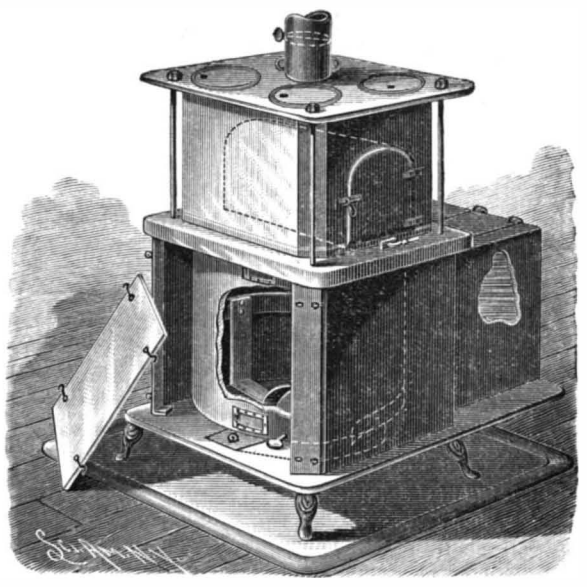


WINCHESTER'S LEAK STOPPER FOR VESSELS.

For further information relative to this invention address Mr. William Winchester, in care of United States Navy Pay Office, San Francisco, Cal.

AN IMPROVED STRAW-BURNING STOVE.

A stove especially designed to burn straw, stubble, or barn refuse, in which there are no pipes liable to easily clog with soot, and the free escape of the ashes is provided for, is represented in the accompanying illustration, and has been patented by Mrs. Martha A. E. Myers, of Albia, Kansas. The base plate has a hook-shaped flange to receive the marginal lip on the upper edge of a removable ash pan, which has a front lip projecting beyond the fuel magazine, and covered by a damper, by removing which a shovel may be used to take out the ashes. There are also holes in the rear wall of the ash pan to give draught to the stove from below, and the base plate projects rearward from the fuel magazine sufficiently to support a hot water heater next the magazine, the heater being readily attached or removed. The main corner standards are bolted to the base plate and to the plate above the fuel magazine. The base plate has an upwardly extending flange to hold the fuel magazine in position after it has been pushed to place between the front standards, a vertically movable ring above the magazine being adjustable to make a tight joint therewith and confine the products of combustion, except as they are allowed to escape through passages provided by the dampers. Two magazines are supplied with each stove, to allow one to be filled with straw or other light fuel while the other magazine is in use in the stove, the magazine being made principally of sheet metal, and having at the center of its bottom a draught opening operated by a stem or handle extending through the front wall of the magazine, with other dampers in its side walls. The oven above is narrower than the stove body, and has an arched top, providing a hot air chamber around the sides and top of the oven, such chamber having communication with the fuel magazine through openings controlled by dampers, and having an outlet to any suitable chimney flue or to the atmosphere.



MYERS' STRAW-BURNING STOVE.

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THE SITE FOR THE WORLD'S FAIR IN NEW YORK.

The view we give to-day of the Hudson River front of the noble site selected by the New York World's Fair committee affords a good representation of the almost ideal beauty of the location and some of the obvious advantages it possesses. The river here is from sixty to seventy feet deep, close up to the shore, and nearly a mile wide. The unsurpassed waterway it affords to the interior of the Empire State led De Witt Clinton to the building of the Erie Canal, whereby the agricultural productions of the West were first brought practically within reach of the markets of the world. The plateau to the right has an average elevation of about 100 feet, and, according to the plans of the site committee, some 250 of the 393 acres to be included in the area devoted to the exposition are upon this plateau, the front of which upon the river is defined by the magnificent Riverside Drive, than which there is probably no more picturesque avenue in the world, so near to the heart of a great city, although yet but slightly built upon. Anywhere here one cannot help but feel himself in immediate personal touch with life at one of the world's centers, for he is, in fact, almost in the midst of it, and can at the same time enjoy views and scenery which will equal the most lovely reaches of the Rhine. In truth, it is the elevation of the surface and the rare beauty of this portion of the city that has so exalted its pecuniary value as thus far to preserve it from the march of building improvement, and made it possible to locate the great fair upon the choicest portion of Manhattan Island.

In addition to this splendid plateau, more than 100 acres of land to the north and east of Central Park are included in the proposed site, all entirely level, and of the grade of the city streets, the whole space it is thus far intended to occupy amounting to 393 acres. The total area of the Champ de Mars, in which the late Paris exposition was held, is only 325 acres, and of this area only 125 acres were occupied by the buildings of the exposition. But the site is by no means limited to the 393 acres it is now definitely intended to occupy, for it is easy to see, on looking at a map of the lands, that considerably more might be taken without much additional cost, the plans of the committee thus far covering only the lands most readily available, for which consents have been mainly obtained, and on which there are now but few and inexpensive structures.

The bill which the New York State legislature is asked to pass, and to which there is no likelihood of serious opposition, places the world's fair in New York City, for the first time, on a solid financial basis, and one which needs only the appropriate national legislation to render it morally certain that the project will be creditably carried out, short as is the time for preparation. The city is to issue its bonds for ten million dollars for fair purposes and for the completion of the Metropolitan and National History museums, which will be most important adjuncts, thus making, with the five million dollars already subscribed, a sum of fifteen million dollars practically at once available. Prompt work is indispensable, but, with ample means at hand, great things can be done by the right men in a short time, and there is no reason to doubt even this amount of money would be doubled were it necessary for the attainment of the highest success. The bill which the legislature is asked to pass also provides for the temporary closing of streets as may be deemed expedient, for the diversion to other routes of railway lines at present running through the proposed grounds, for bridging streets or avenues as may be needed, and for especial means of so connecting our two great museums with the fair that they will be a part of the whole.

To have the fair in New York, however, it is necessary the government should indorse the project, although New York asks no financial aid from Washington. To obtain the desired participation of exhibitors from other nations, the fair must have an international character, such as can be given to it only by an act of Congress. Other cities have come forward, by their representatives, asking Congress to designate other localities than New York for the fair, but it is no disparagement to the claims of any of them to point out the unequaled advantages afforded by New York City for its financial success, and its value as a promoter of our export and manufacturing trade, in connection with the incomparable location which has been selected as its site. As Mr. Depew said before the Senate committee, the exhibition must be so comprehensive as to fitly present all that we have and all that we can do, and so broadly national and hospitable as to invite and secure the attendance of every other nation; it must impress upon the world the fact that we can supply the articles needed for its necessities and its luxuries, as well and as artistically made, and as cheaply sold, as they can be purchased anywhere else.

The attendance of a large number of foreigners, and their free participation as exhibitors, as well as examiners of the products of American industries, is to the last degree desirable, and it will not be contended that any other place affords the advantages of New York in this respect As for the home attendance, the daily visitors, who are expected not only to pay the expense of the exhibition, but whose very presence is necessary to insure its success, there is nowhere else on the continent any place where it is likely such crowds could and would assemble and be so comfortably taken care of as at the site selected.

At the Paris exposition the largest attendance at any one time was on the closing day, when 400,000 people visited the great show, but 200,000 visitors in a single day was a frequent occurrence. At the Philadelphia exhibition of 1876 the largest attendance on any one occasion was on "Pennsylvania day," when 186,000 visitors passed the turnstiles. But the grounds selected for the fair in New York even surpass those on which the great exposition was held in Paris for accessibility by large crowds of people. The convenience of access by the river front, as shown in our view, will be at once recognized, but every New Yorker will as quickly remember the signs exhibited in all the elevated railway trains, stating that they carry 500,000 passengers a day. The fact is that they now carry considerably more than this every day, in trains which go through the fair site itself or close to it. Then there are the trunk lines of railroad on either side—the main track of the old Hudson River road at the water's edge, and the four-track partially sunk roadway to the Grand Central Depot forming the eastern boundary, with railway connections to every point in the United States, and with convenient points for turnouts and stations sufficient to accommodate any possible number of passengers. In addition to these facilities, to speak of the horse cars, and the many thousands which they now carry daily past the fair site, is but to suggest again the main fact of all, that there are more than one million residents within easy walking distance of the grounds, and quite three millions within a distance the walking of which could not be counted a hardship.

There are no inconsiderable natural difficulties, but there are also wonderful possibilities, in the site itself selected by the New York world's fair committee. It is in every way worthy of the greatest exhibition the world has yet seen, is so situated that it will probably command a larger attendance than would be possible anywhere else, and it will need to be a very good exhibition of art and industry which will not look poorly in comparison with what nature itself offers in this most favored location.

The Great Fair—the Transportation Facilities of New York.

Having looked at the proposed site for the fair, let us turn now to inquire as to the possible attendance a fair thus situated would attract, the facilities for housing those coming from a distance, and the railroad capacity for comfortably handling large masses of people.

The record of the Paris exposition shows the attendance to have been 30,000,000, of which only 3,000,000 were strangers. Thus, 27,000,000 persons, or eight-ninths of the whole, came from Paris and its environs. From this it is evident that such an enterprise must look for its main reliance to its vicinage, that is to say, to the district lying within convenient reach.

At least 300,000 people live within walking distance of it, and there are about 1,400,000 others who can reach the grounds for a 5 cent fare, and in not over thirty minutes from the remotest part of the city. Brooklyn, with a population of nearly 1,000,000, is close at hand. Its people have only to cross the bridge and take the elevated road; cost, 8 cents; time, 30 to 40 minutes. All Long Island trains run to Long Island City. From this point the grounds are distant 25 minutes; fare, 8 cents. Jersey City, Hoboken, and the towns lying adjacent thereto are within from 15 to 25 minutes; fare, 3 or 5 cents. New England people can be landed at the grounds by the New York, New Haven, and Hartford or New York City and Northern Railroad. From New York State the West and Northwest and Canada can be brought direct to the grounds by steamboats from up river and from the rivers and coasts of many adjacent States by the New York Central, a spur running from the Park Avenue viaduct. So, too, with those coming in by the Baltimore and Ohio, Erie, Delaware, Lackawanna and Western, New Jersey Central, New York, Susquehanna and Western, West Shore, and Ontario and Western railroads. Passengers have only to cross the ferry from the New Jersey shore. It will appear from this, of all the great roads running into New York City, not one but could land its passengers upon the fair grounds without any increase of fare. Within a 100 miles radius of the metropolis is an enormous population; a recent estimate made by one familiar with this district goes to prove that between 50,000 and 60,000 excursionists per diem might be expected from this source alone.

At the Paris exposition by far the largest business was done between 3 P. M. and midnight. In this country even a greater part of the population is occupied during business hours, and because of the convenience of the site and the excellent railroad service, this important class could visit the Fair after business hours. Throughout the land there is no site for a fair that can be compared with this, when convenience of transportation for people and merchandise is considered.

The president of the New York Central Railroad estimates that, taking the present site as a center, and within a radius of 200 miles, and including the sections whence people may come in the morning and be back at night, there are 8,000,000 people. There is not in all the country such another populous district.

Accessibility must be an important factor in the selection of a fair site, and transportation facilities another. The enormous advantage of New York in the first particular has already been shown. As to the second we will now inquire. The same authority says: "The transportation problem is the one on which rests more than any other the success of an exposition. It has been the experience of Paris and of other great fairs that, at the close of the day, the visitors want to get away all at once. There is a gala day, for instance, and when the fair closes for the day there are 200,000 tired, hungry, cross people, many with infants clinging to them, and all wanting to get to their homes. How are you to distribute these 200,000? An ordinary steam surface railway, in connection with other appliances, would be doing very well if it had a train of ten cars every five minutes and carried sixty persons in each car. But that would make only 7,000 an hour. A cable road would be doing very well if, with its other business, it carried 6,000 people an hour. A surface road would not do so well. Cabs and carriages are wholly beyond reach. So that 25,000 an hour, I venture to say, on any calculation is the largest number of persons that can be distributed, and it would take eight hours to distribute the whole 200,000. The next day after that experience the fair would close."

Such an enormous assemblage as this, which he intimates would utterly baffle the best efforts of the transportation managers of any other American city and choke every line of travel, could be handled from the New York site, owing to its wonderful accessibility and its multiplicity of means of transit, even more expeditiously than they were handled at the Champ de Mars.

It is interesting in this connection to have the testimony of the transportation managers given in recent interviews as to what their respective roads are capable of. Mr. E. B. Thomas, second vice-president of the New York, Lake Erie and Western, says: "We are always equal to the work of moving our proportion of extra travel with promptness and safety. The Erie is now taking 260 passenger trains a day in and out of Jersey City. I presume the whole of North River ferries will put on an extra service for a common discharge directly to the fair grounds in the vicinity of 110th Street. We can handle one hundred thousand now, and over."

S. M. Williams, comptroller of the Central Railroad of New Jersey, says that "a very considerable proportion of the visitors to the fair would seek temporary lodging and hotel accommodation in New York. So hotel men and tradesmen will reap the main harvest. At the same time there will be a large addition to the daily traffic of leading railway lines. These passengers will ask, expect, and receive from the New Jersey Central reduced rates on the excursion basis. As for their water transportation, my present idea is that we shall issue on our tickets coupons good for river service on some one of the established up and down river lines that are sure to spring into existence as a necessity of the exposition held on Manhattan Island.

"There will be several of these steamboat lines besides hundreds of little independent craft that will operate to keep prices down. Few have any idea as to how this fair will develop and illustrate our river facilities. I am inclined to think these larger river steamboat lines will accommodate the increased traffic of the New Jersey Central, the Pennsylvania, the Erie, the Delaware, Lackawanna and Western, and the West Shore better than any changes in their several present ferry systems."

The superintendent of the Delaware, Lackawanna and Western Railroad Company says: "We will be ready to accommodate all the traffic that will present itself. We moved 28,000 passengers Centennial day, and will be equal to any emergency of the future."

H. W. Maxwell, of the Long Island Railroad, says: "The site as selected will be very convenient for Long Island, and many thousands of visitors may be depended upon to come to the fair with their families frequently. We have a very heavy train service to accommodate this class of travel. We are always ready to increase our facilities when required. The Long Island system, with its two ferries and Pine Street annex, is already prepared to transport immense numbers conveniently either way."

As to accommodations for visitors, it was pointed out at last week's hearing before the senate committee that while an influx of 100,000 strangers uncomfortably crowded the largest city outside of New York that has set up a claim for the fair, quite a million strangers were amply accommodated in the metropolis during the Washington Inaugural Centennial last April, their presence being scarcely noticed among the crowds that are a normal characteristic of its celebrations.

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At Coney Island, Rockaway, Long Beach, Long Branch, and the hundreds of resorts within an hour's ride of the metropolis, a million strangers might readily find comfortable quarters amid the refreshing breezes of sea and sound and river, and in whatever direction they may be sojourning, find ready and direct transit to the site of the great fair.

From the foregoing it is obvious that New York is the most favorable, indeed, the only practicable, site for a world's fair. First, because possessing superior facilities for the comfortable housing and carriage of multitudes, and again because it is the only location where such an enterprise could be rendered truly international; the record of all the world's fairs of modern times showing not a single instance where success was achieved outside of a metropolis.

The Great Fair—Addresses before the Senate Committee.

On the 11th of January the first hearing before the senate committee took place in Washington, on which occasion the representatives from Chicago, St. Louis, and New York were present and made able addresses, in which the respective merits of the three cities were eloquently set forth. The deputation from New York consisted of a large number of leading citizens headed by Mayor Grant. Addresses on behalf of this city were made by Mr. Chauncey M. Depew, Mr. Bourke Cockran, Mr. Warner Miller, and others. We make a brief abstract from Mr. Depew's address:

"No fair has ever been successful unless held in the metropolis of the nation which authorized the exhibition. When freed from sectional ambitions or jealousies at home, we view with impartial eye the situation abroad.

We all admit that exhibitions held for Great Britain at Liverpool or Manchester, for France at Lyons or Marseilles, for Italy at Florence or Naples, for Germany at Dresden or Leipzig, would be failures; while it has been demonstrated from past experience that exhibitions held at the metropolis of any country, like London or Paris, are successful in attracting all that there is of the country in which the city is located, as well as all the world beside.

I saw two years ago an attempted universal exhibition at Liverpool, and, while excellent in every way, it attracted little attention even in Great Britain; while two local exhibitions held within the past three years in London, one called "The Healtheries" and the other called "The Italian," were almost equal to the French fair of last summer in attendance, in value and variety of exhibits, and in results.

No one will dispute that New York is the metropolis of this continent. Its population, its resources, the representative character of its business, the fact that three-fourths of the imports of the country come into its harbor, all make it such.

There is not a cotton or woolen mill, a furnace, forge, or factory, a mine at work or projected in the United States, which does not have its principal office in the city of New York. The conventions of all the trades, which are annually held for mutual benefit, take place in New York, and are all closed with an annual banquet, which I invariably attend.

A panic in New York is the paralysis of the country. Prosperity in New York means immense freight upon the railways and enormous production from farm and factory and mine. New York simply records as the barometer the conditions of trade and production all over the country.

To make a fair successful, a population immediately in contact is absolutely necessary. The French fair had its 30,000,000 of visitors, and its 200,000 a day, because it was in the midst of a great resident population, which, for a few cents, and with the least loss of time, could repeatedly visit the exhibition. St. Louis and Chicago present the most fallacious of arguments in their famous "circles of population."

A circle about St. Louis, of 500 miles to the Gulf of Mexico and the Atlantic Ocean, may have 27,000,000. A similar circle about Chicago, to the North Pole and the Pacific Ocean, may have 25,000,000. A similar circle about New York may have 22,000,000.

A similar circle about Washington may have 20,000,000, and without much difficulty we shall have for the purposes of this fair, within these circles, three or four hundred millions of people, and yet not include over one-half of the present located population of the United States.

A similar circle drawn with Peekskill as a center—a village upon the Hudson where I was born—takes in the Hudson River and the Mohawk valleys, with their continuous villages and cities and unequaled scenery, includes Boston and Philadelphia, and presents a compact population which in wealth, in ability to travel, in appreciation of exhibitions and determination to visit them, is unequaled anywhere in the country.

But then Peekskill is deficient in hotel accommodations and in internal lines of travel necessary to carry vast masses to a fair ground and to take them comfortably away. The success of an exhibition is in populations in contact with the fair.

Take a point centrally located at Jersey City, and draw about it a radius of equal diameter and extent to a line drawn from a point on Lake Michigan around the boundaries of Chicago, and you have a larger population than there is in the city of Chicago. You cross the river by ferry, and you have on the island of Manhattan the city of New York, with 600,000 more people than there are in Chicago. You cross to Long Island by the Brooklyn Bridge. and a circle again thrown out, covering the same territory on Long Island as is included in the boundaries of Chicago, has more population than there is in Chicago.

So that, within what might properly be called the city of New York, there are three Chicagos and a half. Then, if you take Central Park as a center, and within a radius of 200 miles, including the distance where people can come in the morning and go back at night, there are 8,000,000 of people. The lunch basket and dinner pail brigade, who are the real supporters of a fair, and can get there for a minimum of five cents and a maximum of $2, to the number of not less than 8,000,000, are tributary to the New York exhibition. That of itself makes it a phenomenal success, and can be met by no similar fact from any other place on the American continent.

New York is situated, fortunately for such a purpose, on an island—a narrow island. From the fair grounds to the river on either side is a walk of fifteen minutes, or a ride of ten minutes in an electric car that is to be provided. And then, along the water front, there is a mile on either side of docks and piers where the largest ships can come up and transfer their products coming from abroad, and where visitors will find steamboats that will take them up the Hudson River, or over to Staten Island, or to Long Island, or down the East River; where ferryboats will carry them to Jersey City, and there deliver them to the network of railroads centering in Jersey City, and distribute them all over the United States. So that by the river on either side, in such close propinquity to the center of population, by the methods of travel already provided and those which will be provided, these 200,000 people can be distributed more rapidly than they were distributed from the Champ de Mars.

Now, beyond all other things in the world, it is money that makes a fair a success; it is the lack of money that makes it a failure. A fair cannot go on credit. It is too diffuse. It is not like a corporation that can sell its assets when it has no assets (laughter), that can sell its bonds, because everybody understands what it is.

In New York we have $5,000,000 of subscriptions. The subscriptions are on a contract binding on the estates of the subscribers, and enforceable. The contract has been looked over by the most careful financiers of the city of New York, and the solvency of the subscribers tested. Those who were not completely solvent (to the extent of several hundreds) have been wiped off, and there is still a *bona fide* and collectible assessment of about $5,300,000.

The committee on legislation have unanimously adopted a bill asking the legislature to authorize the city of New York to expend $10,000,000 in buildings and grounds. There is no doubt about this authorization.

It has been alleged against New York that she has no local pride. That is true. London has no local pride. Paris has no local pride. Immense aggregations of people from different parts of the country, and largely representative of different sections, do not have local pride. But the people of New York do know (with their large views) what the exhibition should be; and we are here to urge the selection of New York, not because we are New Yorkers, but because we want the fair to be a phenomenal national success. (Applause.) Washington is unequaled in its avenues, in its public buildings, and we admit it. St. Louis has age, she has also an unequaled position in the great valley of the Mississippi, and we admit what she is and what she promises to be. Chicago is the most phenomenal development of urban progress that the world has ever seen, and we admit it. Not only in all that constitutes a great central and commercial metropolis, but also in the arts, and in culture, she has, in her forty years, gone forward with unequaled and immeasurable strides. All this we admit, and still we claim that New York is the great center, New York is the great metropolis, New York is the great representative city of America. New York has no sectionalism, New York has no jealousies.

If the government should to-day appropriate to every family in the United States the money which would carry them to one place, with the distinct understanding that they could select no other, the vote, with a unanimity unequaled in the expression of desire, from Maine to the Gulf, from the Atlantic to the Pacific, among farmers, ranchmen, minemen, merchants, artisans, professional men, journalists, artists, would be, 'Take me to New York.'"

Mr. W. Bourke Cockran said: "The greatest exhibit that we can offer are two millions of human beings leaving their homes in the morning and returning to them at night after days of labor which result in an increase of the wealth of the community. And that exhibit can be offered right at the gateway of the commerce of this country. And it will be offered to him who visits the country, not as New York's exhibit, not as a source of gratification to our pride, but as an instance of what this vast country which lies behind us has done in building up the commercial metropolis of the country. It is for these reasons that we ask this exposition, not as a claim of the city, but as a submission on the part of the city of such facts as the committee should have in mind in deciding a question of such vast importance to the people of this country, and of such vast importance to the people of the whole civilized world. . . .

We show beyond all that the broad avenues on which are the magnificent rows of buildings devoted to commerce and industry; beyond that the splendid temples devoted to worship; beyond that the palaces that line the residential quarters of our cities, in which opulence and wealth are housed; beyond that the wharves crowded with vessels from all cities of the world and where the flags of every nation rise and fall with every breeze; beyond that the banks with their accumulated treasure in their vaults; beyond every type and sign of wealth, we have that liberty which forms and opens up the sole avenue to wealth which mankind can afford to keep open. That city rises on the borders of the sea that Columbus conquered, and no exposition can carry out this great event in a place not in sight of that ocean over which he won his victory, as well as in the presence of the land which he opened up to civilization, and which has been the cradle of liberty."

Chicago was most ably advocated by Mayor Cregier, Mr. T. B. Bryan, and Mr. E. T. Jeffrey.

He filed a sworn certificate of the treasurer of the guarantee fund that it amounted to $5,000,000 of *bona fide* subscriptions. To show the possible sites for the fair and the facilities for transportation, Mr. Jeffrey displayed the large map, on which he pointed out the five parks—Jackson, Washington, Humboldt, Garfield and Douglas—containing over two thousand acres, in addition to the lake front park, any one of which would accommodate the exposition buildings. The lake front would permit the display of a marine exhibit which could include a reproduction of Columbus' squadron of 400 years ago, a great object lesson. The railroad transportation of the city is unequaled by that of any city of the world, comprising as it does the terminals of twenty-four railroads, with their network of connecting and belt tracks. On this point Mr. Jeffrey said he spoke from personal knowledge and observation.

He then gave the committee figures showing the marvelous growth of Chicago in every development of business. Mr. Jeffrey stated that an estimate he had made showed that the rail and water lines of Chicago, as they now exist, but with increased equipment, could handle 162,095 passengers per hour—an unequaled showing, as far as rail facilities are concerned.

A Novel Mode of Warfare.

A New Jersey inventor thinks he has hit upon a method of establishing peace permanently upon the earth by means of electricity. He does not propose to remodel human nature, but expects to make warfare so deadly that it will be sheer madness for one nation to attack another. According to his plan, warfare would result in the substantial extermination of all who ventured to engage in it. The inventor describes his idea thus: "In a word, my scheme is to produce artificial lightning. Thus far the experiments have been confined within narrow limits, but with the use of a small dynamo attached to my invention a slight shock can be produced, effective enough to kill the flies in a 20×20 room. I claim, with the use of powerful dynamos, under my plan, a flash of lightning can be directed against an army a mile or more away and without injury to the party operating the gun, scattering death and consternation among the troops. With powerful dynamos thousands of soldiers can be killed at a flash, and a number of flashes are enough to destroy an army. It can be used at any time except on rainy or damp days. If the effect of giving this discovery would be, as I hope, to put an end to war, I should feel repaid, but I dread to think of electricity being used in war under my plan. The consequences would be enormous. It means nothing less than extermination to the opposing army. Before going any further with it, I would ask your opinion as to the effect upon war of an instrument such as I have hinted at. Would it retard or facilitate war?"—*Western Electrician.*

Advertisers' Directory.

J. Walter Thomson, 38 Park Row, New York, has just issued an attractive manual for advertisers. It is illustrated with full page photo-engravings of the first page of the principal trade journals and other publications, devoted to special subjects, including agricultural, medical, mining, lumber, etc. The electrical papers occupy a number of pages, and the SCIENTIFIC AMERICAN publications are not omitted. The volume comprises 250 pages, and is useful to advertisers.

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The World on Wheels.

In every sense of the word we are living in an age of locomotion. A very large proportion of the people are on wheels the greatest part of their time, and travel to an extent undreamed of by those who lived but a generation ago. If, at any given hour of the day or night, on any day in the year, every train of cars, every surface car in our cities, and every vessel on the oceans, lakes, and rivers in the world could be stopped and a census taken of the people on board, and if to this number were added those who were waiting at depots or docks to get on board, there would be found enough people to populate a nation. This is truly a remarkable state of things; and it means the intercourse, the intermingling of the members of the human family to an extent that has probably never been contemplated by any one who has written the history of our race. Who, then, can possibly estimate the effects which this state of things is destined to produce upon the future condition of mankind? It is certainly one of the most potential factors in the formative forces now at work in mapping out the future relationships of humanity. Its effects cannot be transitory nor local, but will certainly be permanent, widespread, universal.

One effect, however, of direct and personal interest to the readers of this journal is that this spirit and habit of travel has, in its turn, created a demand for an immense number of vehicles for personal use. The past thirty or forty years, at the most, have shown a production of these vehicles in numbers which are unprecedented, and which would have seemed simply fabulous to those who lived a half century ago. A large number of carriage factories are at this moment in operation, some of which annually produce from 20,000 to 30,000 new vehicles; and besides these large establishments, innumerable smaller factories and shops are to be found throughout our cities and villages. In addition to these immense workshops for turning out complete vehicles of all descriptions, there are many other factories for the production of the various parts and requisites, such as wheels, axles, springs, gears, bodies, bolts, varnish, etc. A large proportion of these parts is required for new work in factories, while a large proportion is also required for the repair shops, to keep pace with the ceaseless requirements of wear and tear.

To obtain some idea of the magnitude of these associated industries, we may state that in this country alone there are many large wheel factories, some of which produce from 50,000 to 80,000 sets of wheels every year; while among the list of large axle factories, one, at least, advertises an annual output of 400,000 sets, while many others produce from 75,000 to 120,000 sets per year. The spring makers and those engaged in kindred lines of trade are, of course, keeping pace with the wheel and axle makers. Notwithstanding its present magnitude, this enormous industry has grown up mainly in the past twenty-five or thirty years, and seems to be increasing and still increasing. It goes without saying that the growth of so vast an industry has called into action, or rather developed the place for, an immense array of skilled artisans of a very high order of ability, and has, also, to a remarkable degree, incited the inventive genius, and caused the production of an endless list of devices for the improvement of vehicles and all their various parts. The vehicle of to-day, whether a pleasure carriage or a heavy truck for business purposes in our great cities, is in striking contrast with those in use but a few decades ago. Some of the most decided improvements in the art of carriage making have been developed within the past five or ten years, and some of these indeed are but just beginning to meet with that recognition which their value demands.—*The Hub.*

DANDRUFF.—The application of chloral hydrate in solution of five grains to the ounce of water, is said to clear the head of dandruff and prevent falling of the hair from the latter cause.

PROGRESS OF ELECTRIC LIGHTING IN LONDON.

The electric machinery of the newly completed establishment of the London Supply Company, Deptford Central Station, contains probably the largest dynamo machines ever constructed. They are of the Ferranti type, and some idea of their enormous dimensions will be gained when we say the dynamos are 42 feet in diameter at the armature—nearly as large as two ordinary four-story dwelling houses.

Our illustrations and particulars are from the *Engineer*. In the foreground of Fig. 1 is seen the forty-grooved pulley of one of the great dynamos mounted on its bearings, the pedestals of which are attached to the large bed plates, which at the left hand end support the big field magnet frames. The pulley shown is provided at one end with a big flange, in which are a number of holes tapped for the receipt of the stems of the armature coils. These coils are of copper tape, or rather flat copper strip, built up on a central support of brass, flat brass rods separated by an asbestos and sulphur mixture. These coils are screwed radially into the flange of the big drum, and are surrounded by the double ring of field magnets, which cover the whole of that end of the pulley which has no grooves.

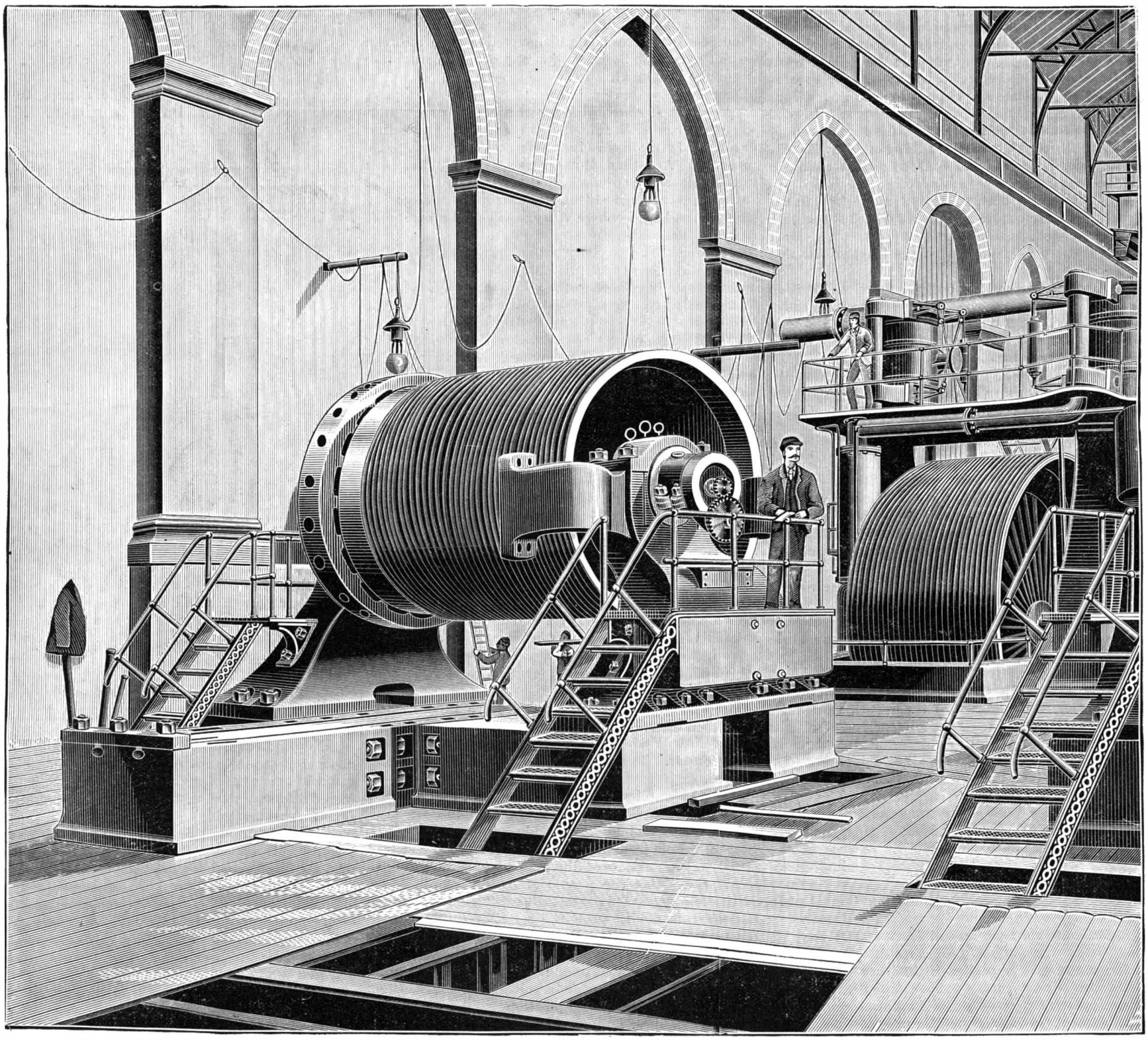

Fig. 1.—LONDON ELECTRIC SUPPLY CO.—THE FORTY-GROOVED PULLEY OF ONE OF THE GREAT DYNAMOS.

Fig. 2 shows the dynamos completed. Fig. 3 shows the arrangement of a pair of the dynamos and driving engines. Fig. 4 represents the exterior of the building in which these gigantic machines with their enormous engines and boilers are housed.

The company began practically through Sir Coutts Lindsay undertaking, in November, 1884, to light the Grosvenor gallery with electricity. He received offers from neighbors to supply them with the light, and the work was made much larger than was originally intended. The demand kept on increasing till, in October, 1887, it was found necessary to move. The promoters extended their company and adopted the name of "The London."

The construction of the great works at Deptford, with their powerful machinery, was begun in April,

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1888. The chairman of the company says: "We have been at it night and day ever since. Now we have a very large engine house erected, and have engines and dynamos at work of 3,000 horse power. Two other dynamos and engines are in course of construction, of

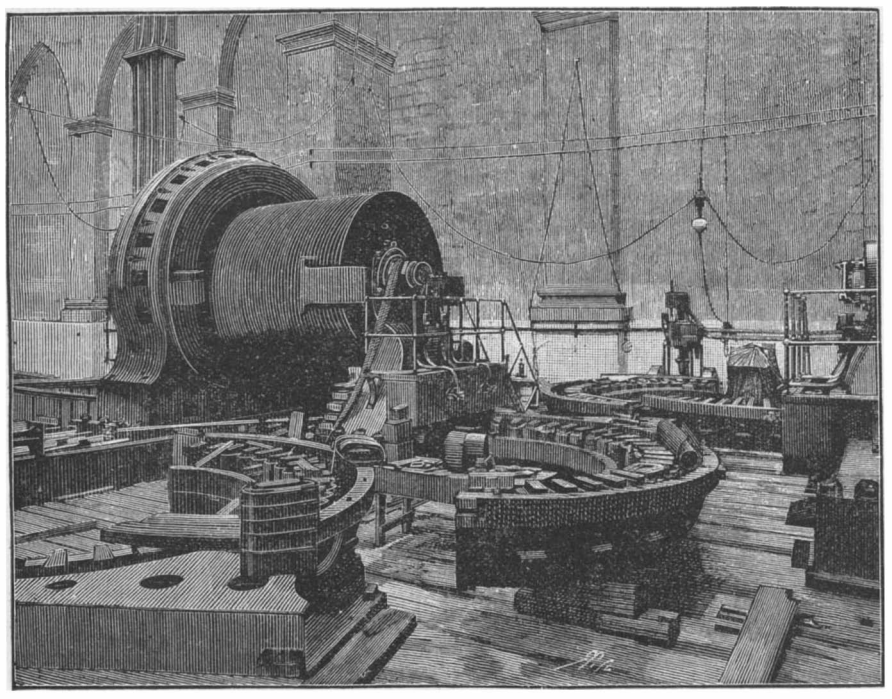

Fig. 2.—THE GREAT FERRANTI DYNAMO.

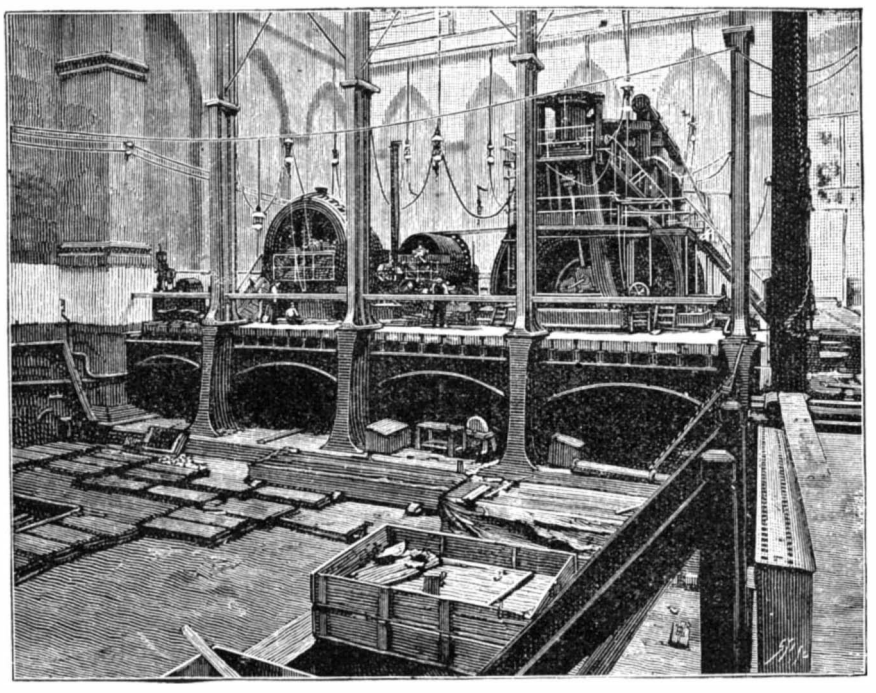

Fig. 3.—ENGINES AND DYNAMOS.

5,000 horse power each. The boiler power we have put down is 14,000 horse power. We found, when we inquired as to the construction of these dynamos, that there were no tools big enough to deal with them, except a few in arsenals and private works. We tried Krupp, in Germany, and the Creusot works, in France, and neither of them would contract to deliver under three years. As it did not suit our purpose to wait so long, we put up machinery ourselves, and we shall be able to complete these dynamos in a year. They are of unprecedented size.

"The lathe required to turn the main shaft is of the same dimensions as that used for turning the 100 ton gun at Woolwich. The shafts are 36 inches in diameter, and in the rough weighed 70 tons. They were the largest castings of steel ever made in Scotland. The dynamos are 42 feet in diameter at the armature. As to their lighting power, the dynamos working now at Deptford will supply 25,000 lights, and the two being constructed will rise to 100,000 each. These new ones are devised so that, as the demand arises, we can put another engine upon each dynamo of 5,000 horse power, so that each will be up to 10,000 horse power, making them 200,000 lights each nominally. We are also manufacturing the mains ourselves, and four machines are turning them out in 20 foot lengths. This is all that we require for 100,000 lights. The largest of our mains will be 2¼ inches over all, and the smallest 1¼ inches. There is no cable, but a tube of copper, having a quarter of an inch sectional area, through which the current is sent out. This has a cover of insulating material, and a second copper tube is compressed round that for the return current. Another thin layer of insulating material is used, and over all is placed an iron tube, also made tight for protection against pickaxes in the street.

"With this main we require no box or brickwork in the streets, as it is put naked into the earth. The outer tube is wrought iron a quarter of an inch thick, and is sufficiently flexible to bend at right angles without breaking, while strong enough to resist any weight that may go over it without damage. There will be a joint for 'service' at each twenty feet, so that every house can have the light if required. A main on this approached before in electrical work. We bring up our mains to distributing stations, where the tension is reduced from 10,000 to 2,400 volts. Then it is sent through the streets underground, and at each house it is again reduced by means of transformers to a working pressure of 100 volts. By arrangement with the railway company the current is brought up from our generating station at Deptford along the Southeastern line. We have running powers into Cannon Street station, over Ludgate Railway bridge, and over Charing Cross bridge. Two mains are laid alongside the line. The advantage of this is that we have got a private way, in addition to the right of way through the public streets under our order, which we intend in due course to make use of. We have also running powers over the District Underground for these mains. Eventually we shall have eight or ten stations to distribute the light from, and at the present we have practically six, including the Grosvenor, from which the machinery will be removed later on."

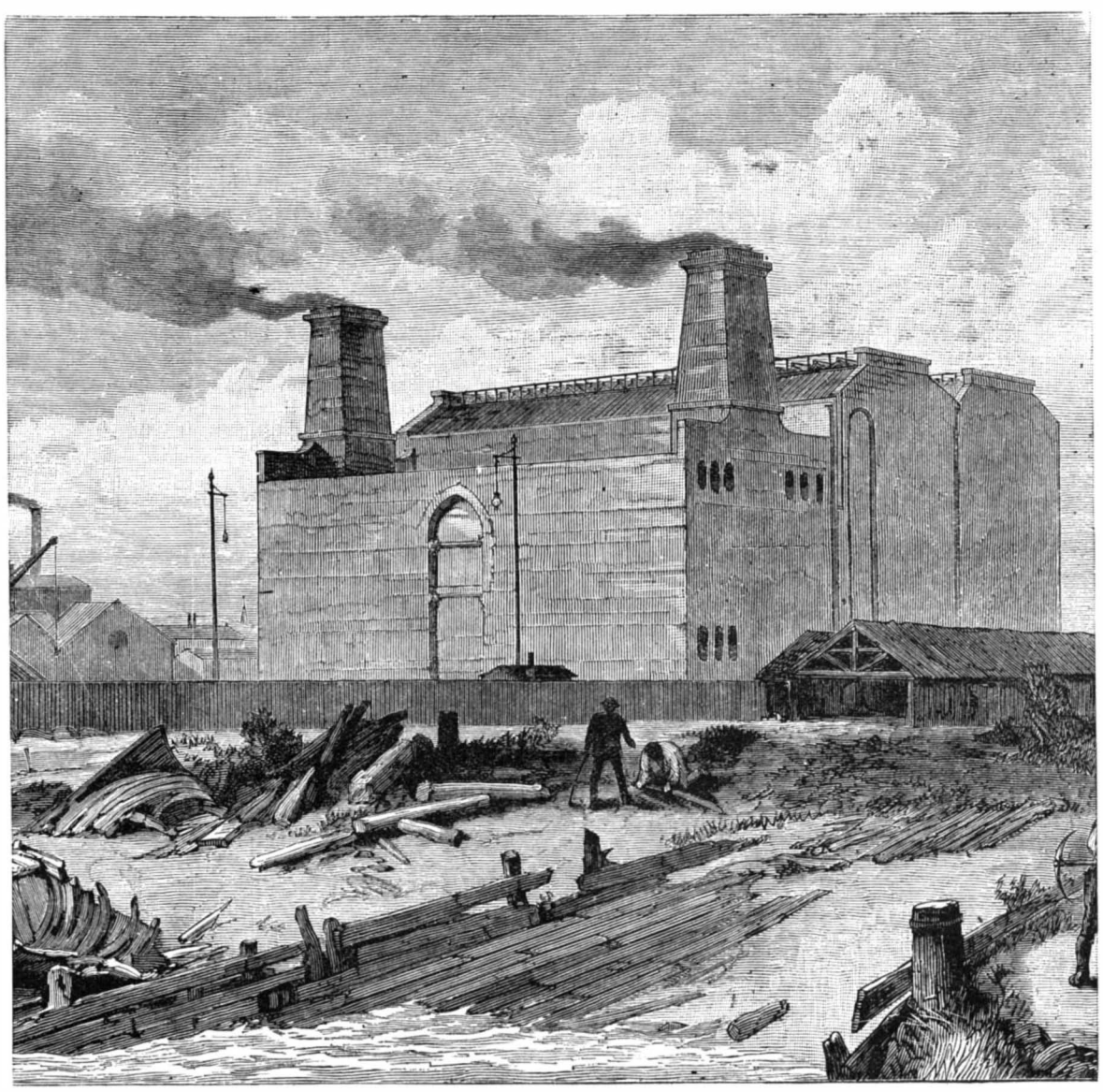

Fig. 4.—THE LONDON ELECTRIC SUPPLY CORPORATION'S WORKS AT DEPTFORD.

The Florida Ship Canal.

The State of Florida suggests to Congress that the St. John's River and its tributaries form a great navigable waterway of the State on the eastern side of the peninsula from the south to the north, and with its continuous chains of lakes form a vast body of fresh water, and when its area is increased by this ship canal, and the lakes in the interior of the State thereby connected, these inland waters will afford to the United States naval stations in fresh water of unexampled advantage, extent, and convenience, not only for its own ships and vessels, but for all ships and vessels engaged in commerce.

The State of Florida commends to Congress this great enterprise of a ship canal across its territory, that American ships and American products may safely pass to and from every portion of our great country without leaving our coast line or sailing in foreign waters, and to that end the State of Florida asks from the Congress of the United States that, within its constitutional powers, it will deepen and improve the entrance to the St. John's River from the ocean, and its navigable waters from its mouth to the point of intersection with this proposed ship canal; and that it will deepen and otherwise improve the harbors and entrance ways thereto from the Atlantic Ocean and Gulf of Mexico, and that in all ways and means deemed just and expedient it will favor and encourage the construction of this ship canal across the State of Florida from the ocean to the Gulf.

CARE NECESSARY FOR PIPE LINES.—The oil pipe line which was recently constructed from Cygnet, Wood County, Ohio, to Cleveland, is one of the best in the country, yet it is necessary to watch it vigilantly to prevent any leaks. Track walkers pass over every mile of the line each day, about 15 miles being assigned to each man. Every walker is a telegraph operator and is supplied with a pocket instrument. Should he discover a leak in the line, he immediately telegraphs the division superintendent. At stated intervals along the telegraph lines wires run down the poles into locked boxes, the key of which is carried by the walker. Opening the box, he attaches his instrument and wires a report to headquarters.

A SMALL box filled with lime and placed on a shelf in the pantry or closest will absorb dampness and keep the air in the closet dry and sweet.

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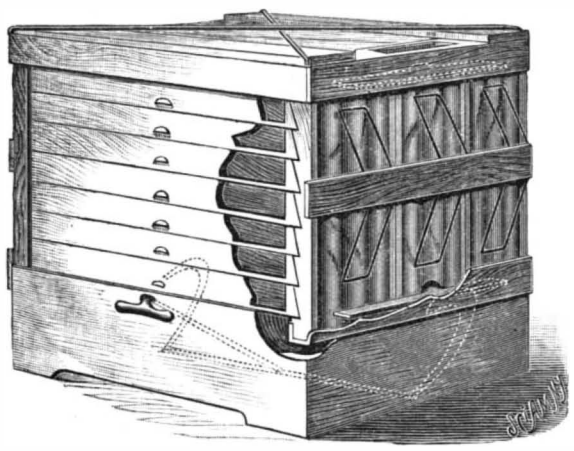
AN IMPROVED FRUIT DRIER.

A fruit drier especially designed for use in the drying of small amounts of fruit over an ordinary kitchen stove is shown in the accompanying illustration, and has been patented by Mr. Frank H. Gilbert, of Union Ridge, Washington. The drier is made in the form of a rectangular frame having a downwardly extending metallic shield, the lower edges of the front and back walls of which are cut away to provide for the entrance of a current of air. At each corner of the frame are posts, the upper ends of the posts being connected by another frame braced by diagonal wires. The posts are also attached by transverse end strips, and the top and bottom frames have flanges serving to support three vertical racks on each side, each rack being formed with a number of supporting shoulders. The racks are preferably made of sheet metal bent to give sufficient rigidity to stepped sections of the rack by a corrugated back, the racks being held in yielding contact with the top and bottom flanges by springs secured to the middle transverse end strip. The racks form the sides of the drier, and the fronts of the drawers its front, and the top frame is centrally apertured at its ends, just above the central racks, to facilitate the raising of these racks. To the bottom frame are pivotally connected two bell crank levers, the short arms of which ride in apertures formed near the lower ends of the central racks, the levers being connected by a rod having a stem extending through an aperture in the front of the drier near its base. In order that the racks may be held against accidental displacement, swinging stops are attached to the top and bottom end strips, these stops allowing the side racks to yield as the drawers are raised with the central racks, and resuming their normal position when the central racks are lowered. The bottoms of the drawers are made with wire cloth screens, on which the fruit rests, the ends of the drawers fitting against the inner stepped walls of the racks. As the fruit in the upper drawer becomes dry, the drawer may be removed and the other drawers moved upward one step by drawing out the stem extending through the front of the drier near



GILBERT'S FRUIT DRIER.

its base, the bell crank levers then operating to raise the central one of the three racks on each side, and thus carry up the trays, the racks moving back against the tension of the side springs. By this construction also the progress made in the drying of the fruit held in any particular drawer may be readily observed without disturbing the other drawers.

A Hint Manufacturers Should Regard.

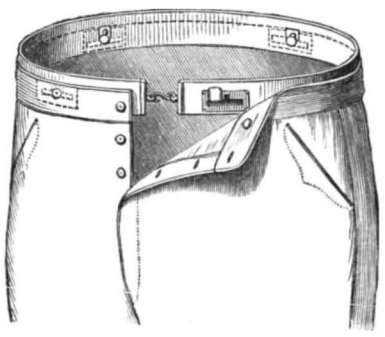
The United States consul at Marseilles furnishes, in a recent report, the following information as to the ways of trading adopted by some American firms. The American manufacturer sends to a consulate abroad a catalogue, a package of circulars (all in English, of course), and a lithographed letter stating that he has decided to open a foreign trade, and asking that the circulars be distributed among firms in the consul's district who might likely be interested in his machine or product. In many cases the article offered is practically new in the foreign market, designed to supply a popular want which has hitherto been scarcely felt outside the United States. The consul, however, distributes the circulars, translates and explains them, and persuades one or more firms in his district to write for further information, particularly in respect to terms. Not infrequently the reply is something like this:

"DEAR SIR: Yours of the 15th at hand and contents noted. Our terms are five per cent from list f. o. b. cash, or three days' sight on B. L. Yours truly, U. S. & Co."

The foreign merchant—a Frenchman, let us say—sits down with his lexicon to translate this sententious response, and if he succeeds, which he frequently does not, he feels that in some way his inquiry has given offense, and this brusque, laconic reply must have been meant as a rebuke. The letter says just what the American means, but to a person trained in the elaborate and courteous phraseology of French commerce, such economy of words is chilling. But, most important of all, he finds the proposed terms quite out of the question. For a standard article of popular utility manufactured in his own country, the French merchant may, and often does, pay cash or its equivalent within thirty days of receipt of goods; but as to sending money across the Atlantic to pay in advance for an article which is to be at best an experiment, all this is quite out of his line, and the incipient negotiation falls to the ground.

AN IMPROVED SUSPENDER BELT.

The accompanying illustration represents a suspender belt designed to be especially useful for firemen, policemen, and military men, as well as for lawn tennis and baseball players, etc. It has been patented by Mr. George Van Duzer, of the American Institute, Clinton Hall, Astor Place, New York City, and patents therefor have also been taken out in England, France, Germany, and Canada. The main portion or band may be of leather, or thin metal, or of any woven fabric, the ends being provided with any approved form of buckle or link or clasp fastening device. To the outer face of the belt a series of button clasps are attached, adapted to engage buttons secured on the inner face of the waistband of the garment, whereby the latter will be securely supported without showing buttons at the outside, and also allowing the garment to be quickly loosened or readjusted. The clasp plate is preferably made with marginal holes in its corners, to facilitate attachment to the belt, and in its central portion is a lengthwise slot adapted to receive the shank of a trousers or garment button. The plate also has a short transverse slot or notch opening downward into the longitudinal slot, providing for a more easy engagement of the button with the clasp, a latch sleeve being fitted to slide on one side of the clasp plate and cover this notch, thus securely latching or locking the button in the clasp. The belt band may, if desired, be wholly concealed within the garment waistband, or be made to show a narrow strip or girdle slightly above it, as may seem preferable with silk or colored belts worn with fancy costumes, etc.



VAN DUZER'S SUSPENDER BELT.

AN ELECTRIC STENOGRAPHIC PEN.

The accompanying illustration represents a pen for stenography, in which the record is made through the medium of an electric current controlled by the feet and hands of the operator. This is an invention patented by Mr. Augustus S. Cooper, of Santa Barbara, Cal. To one pole of a battery is connected a metallic plate, upon which is placed the prepared paper for receiving the record, and to the opposite pole is connected a conductor from which extend ten branches, there being placed in each of these branches, except No. 1, an open circuit key, and all of the branches being connected with an electric pen adapted to be held on the record plate. The keys of five of the branches are arranged to be conveniently touched by the thumb and fingers of the left hand; the key of one branch is arranged to be operated by the palm of the hand, while the key of another branch is isolated, but conveniently near the other keys, so that it may be touched as occasion requires. The keys of two of the branches are arranged to be touched by the feet, while No. 1 is in constant communication with the generator, so that whenever the pen touches the paper a mark is made, whether a record is being formed or not. The pen is formed with a series of ten conductors, insulated from each other and arranged in a handle of convenient size. The conductors are rendered interchangeable by dividing them and connecting the divided ends by thumb-screws. It is designed that different combinations of these branches will represent the letters of the alphabet, and by the opening and closing of the keys, suitably arranged in combination with a convenient finger board, and by moving the pen over the prepared paper in different forms, the prefixes, suffixes, and roots of the language will be made, word signs being supplied in the same manner.

COOPER'S ELECTRIC STENOGRAPHIC PEN.

Sinking of the Northern Coast of France.

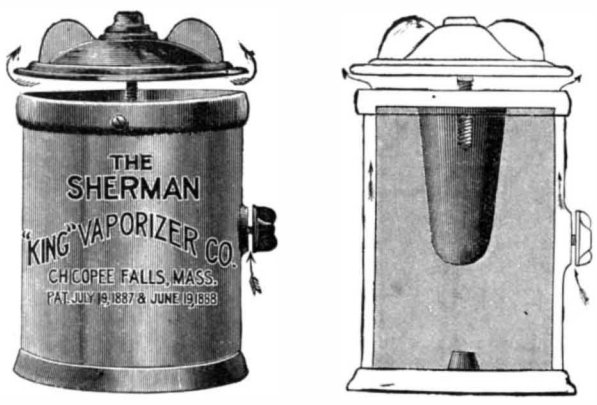
This has recently been proved by measurements. Since 1884 the "genic" corps of engineers have been engaged in effecting level measurements over the whole country, and it has been shown that the country sinks from the south toward the north. Thus between Marseilles and Lille—a distance of 540 miles—the sinking amounts to 10 inches annually. If this movement continues, the northern part of France may in a few centuries become submerged. It may here be mentioned that off the coast of St. Malo, in fine weather, fossilized trunks of trees may be seen at the bottom of the sea, indicating that these parts were once above water.—*Research.*

THE SHERMAN "KING" VAPORIZER.

The necessity for aerial disinfection is recognized by all sanitarians. To carry out such treatment properly and provide a simple apparatus adapted for use in the household and wherever required has been a difficult problem; but it has been successfully solved in the vaporizer which we here illustrate.

The device consists of an iron vessel provided with a tightly fitting lid that can be held down with a screw, inclosing a porous cup. A small aperture closed by a screw valve is arranged on the side of the case about half way up from the base. A volatile disinfecting fluid is used to saturate the porous cup. The latter can absorb about one-half its bulk of fluid.

The liquid that has been selected is a coal tar product characterized by the presence of phenol and cresol. This is of wide reputation as a disinfectant. To cause it to be delivered in suitable quantities, the top and side apertures are both slightly opened. A current of air at once begins to issue from the apparatus,



THE SHERMAN "KING" VAPORIZER.

carrying with it the volatile disinfectants. The quantity of disinfecting air delivered can be regulated by opening or closing the lid and valve.

The apparatus may be placed in any desired place. It is neat in appearance, if upset can do no harm, and it is practically indestructible.

In short, it supplies a means for delivering constantly volatile disinfectants, and at the same time for regulating the supply as desired. A single saturation of the porous cup lasts for three months. It is inexpensive, and in maintenance requires only nominal attention. It is a most useful article, and should be abundantly placed in every building in the land.

For further particulars the reader is referred to the manufacturers, Sherman "King" Vaporizer Company, Chicopee Falls, Mass.

Who Can Best be Spared?

Young men, this is the first question your employers ask themselves when business becomes slack, and when it is thought necessary to economize in the matter of salaries. "Who can best be spared?" The barnacles, the shirks, the makeshifts, somebody's proteges, somebody's nephews, and especially somebody's good-for-nothing. Young men, please remember that these are not the ones who are called for when responsible positions are to be filled. Would you like to gauge your own future for a position of prominence? Would you like to know the probabilities of your getting such a position? Inquire within! What are you doing to make yourself valuable in the position you now occupy? If you are doing with your might what your hands find to do, the chances are ten to one that you soon become so valuable in that position that you cannot be spared from it; and then, singular to relate, will be the very time when you will be sought out for promotion for a better place.—*The Medical Record.*

AN alloy that expands in cooling and is suitable for repairing cracks in cast iron is made with nine parts of lead, two of antimony, and one of bismuth.

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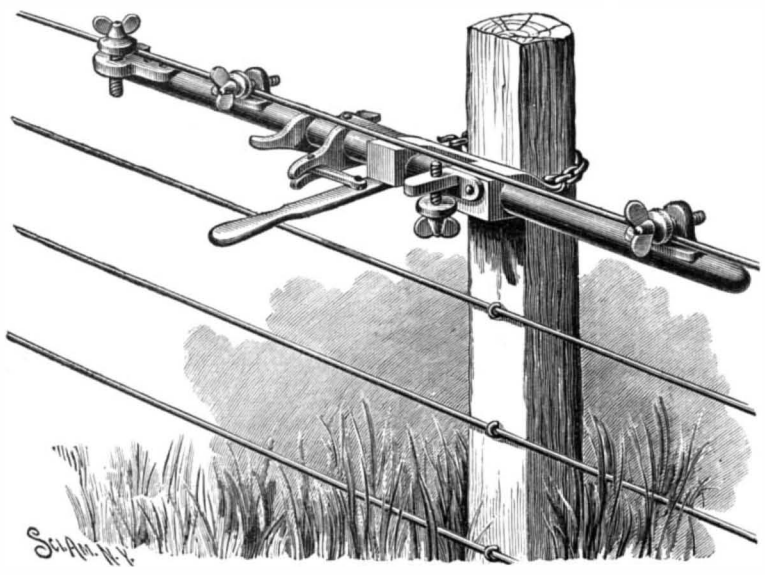
AN IMPROVED FENCE WIRE STRETCHER.

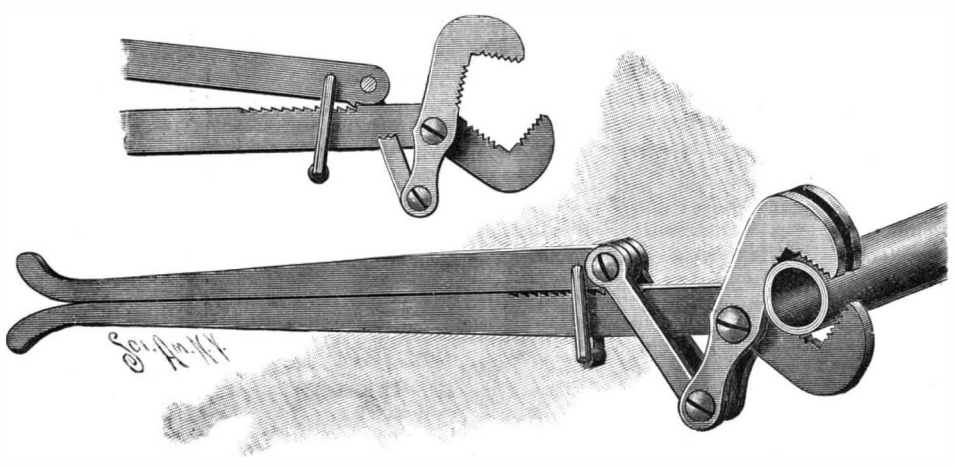
A device whereby fence wires may be conveniently stretched beyond the posts, and stapled or otherwise attached while stretched, without hinderance, is illustrated herewith, and has been patented by Mr. Zadoc V. Long, of Peoria, Neb. A draw rod is held to slide freely in a sleeve adapted for attachment to the fence post by a length of chain. At one end of the draw rod is a guide clamp, and upon the same side of the rod one or more pressure clamps are attached, each pressure clamp consisting of a plate attached longitudinally to the rod, and having a vertical extension at one side in alignment with a flange of the guide clamps, this vertical extension having a threaded aperture for a thumb screw, the inner surface of the thumb screw being corrugated and adapted for contact with the contiguous face of the vertical extension, whereby a strong hold may be obtained upon the wire. There is also a pivoted pressure clamp on the side of the sleeve opposite to that on which it is attached to the post. The draw rod, before being introduced into the sleeve, is passed through two jaws, one jaw extending beyond the farther side of the drawhead to a link connection with a lever fulcrumed on the under face of the sleeve, while the other jaw is carried horizontally outward on the opposite side of the drawhead to be connected by a shorter link with the same lever, the two jaws being thus pivotally connected with the lever, one at each side of the fulcrum, and the jaws being normally held in engagement with the draw rod by springs attached to the links and bearing against one edge of the jaws. The wire having been secured to the draw rod, the lever is worked alternately from left to right, whereby the jaws propel the rod past the post, and gradually tighten or stretch it, when a staple may be driven into the post and the wire made fast thereto, or secured in any other suitable manner. Before fastening the wire the pivoted pressure clamp on the outside of the sleeve may be brought to face in the direction of the other pressure clamps and the wire secured therein, whereupon the thumb screws of the fixed pressure clamps may be released from contact with the wire.



LONG'S FENCE WIRE STRETCHER.

AN IMPROVED PIPE WRENCH.

The accompanying illustration represents a wrench invented by Mr. Richard J. Robbins, adapted to turn a pipe in either direction, without being able to crush the pipe, the wrench being designed to grip to 1-32 of an inch, taking the shortest nipple from any boiler, and enabling a person to work in very close quarters. When the wrench is applied, the jaws are brought in contact with opposite sides of the pipe by sliding the auxiliary lever backward on the main lever, the auxiliary lever being held with its free end away from the main lever, and when both jaws are in contact with the pipe the auxiliary lever is turned toward the main lever, its cam or spud forming the fulcrum on which it turns. The movement produced in the movable jaw by sliding the auxiliary lever is comparatively large, but the movement of the jaw effected by turning the auxiliary lever is quite small, and comparatively powerful, so that a firm grip is obtained without danger of crushing the pipe. The pipe may be turned in either direction when the grip is not released, but when the pipe is to be turned in one particular direction, the grip of the jaws is released during the backward stroke of the wrench, the wrench being readily adjustable and adapting itself to widely varying sizes of pipe. All communications in reference to this device should be addressed to the Graham Vise Wrench, No. 503 Connecticut Street, Buffalo, N. Y.



THE GRAHAM VISE WRENCH.

Haze.

Professor F. A. R. Russell, in *Nature*, says: Unlike fog, haze commonly occurs in this country when the lower air is in a state of unusual dryness. It is not only a frequent accompaniment of a spell of fine dry weather, but may be, when in combination with certain other conditions, a sign of its approach. Night or morning fogs, and in winter persistent fogs, often signify a calm and settled condition of the air and the prevalence of fair weather. Heavy dews, especially in the autumn, likewise portend fine weather, but usually of shorter duration. Fogs appear usually in one of two conditions—either the air is nearly saturated up to a considerable height or else is unusally dry, except in a stratum immediately above the ground. In the first case, radiation or condensation from some cause produces, by a slight lowering of temperature, a large precipitation of vapor; and in the second case, radiation from the earth's surface being excessive, owing to the diathermancy of the dry atmosphere, the stratum next the ground rapidly reaches its dew point, fog is formed, and this fog continues to radiate to the clear sky and further to reduce temperature. Haze, on the other hand, appears often in weather distinguished by unusual dryness, on the surface as well as at a considerable altitude above the ground. The air remains for many days uniformly dry, the nights being nearly dewless, and the sky often free from clouds. The chief difference to be observed, then, is this, that fog requires saturation where it occurs, while haze seems to be favored rather by a dry atmosphere.

Two principal factors go to the production of ordinary haze: the first a rather large amount of vapor between the earth and a great altitude, say 60,000 feet; and the second, a mixture of two heterogeneous masses of air.

It would hardly be reasonable to exclude electricity as a possible agent in the otherwise not wholly accountable phenomena of mist and cloud. It may be that the dust particles of two currents of air differing in electric quality or quantity may be attracted to each other, or that the mixture of currents of different temperature may in some way set up molecular aggregations.

Whatever the cause, we should bear in mind the small quantity of non-transparent matter required to produce the dimming effect of haze. If the eye can observe the color produced in a drop of water by the fifty-millionth of a gramme of fuchsine, possibly a weight of water or dust not much greater would suffice for visibility in a column of air 1,000 feet long. The atmosphere is at all times charged wfth dust particles to a degree which it is difficult to realize. The purest air tested by Mr. Aitken previous to his measurements on the top of Ben Nevis contained about 34,000 dust particles to the cubic inch—this was on the Ayrshire coast. In every cubic foot there would be 35,232,000 particles, and, in a horizontal column of 1,000 feet, 35,232,000,000 particles. It is manifest that a condensation upon a small proportion of these, or an agglomeration of a small proportion into larger groups, or a momentary adhesion by electric attraction, would suffice to produce optical effects.

The evidence concerning the appearance of haze by irregular transmission of light due to unequally heated currents of transparent air seems to be quite insufficient, and however great the heat near the surface of the ground, say in the desert, with consequent distortion of images, it does not, as a rule, bring about the haze so common in temperate climates.

Haze of an abnormal kind need barely be mentioned here—namely, that due to smoke, palpable dust, and the products of volcanoes. It may, however, be very widely spread and very dense. In 1783 Europe was for months covered by the dust ejected by an Icelandic volcano, and the Atlantic for 900 miles west of the northwest coast of Africa is every year subject to a haze composed of fine particles of sand from the Great Desert.

THE NEW ASTIGMATIC LENS FOR OPTICAL INSTRUMENTS.

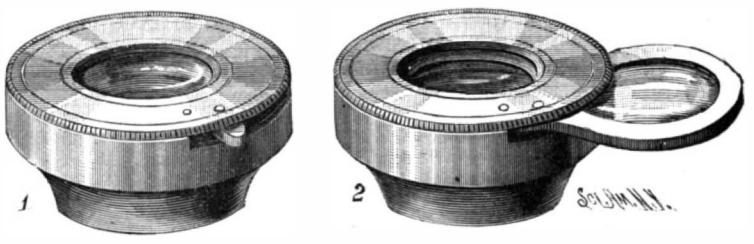
Our engraving shows the new astigmatic eyepiece as adapted for use upon optical instruments, such as opera and field glasses. It consists of an astigmatic lens pivoted to the frame of the ordinary eyepiece. When the astigmatic lens is not needed, the button is depressed, which throws out the lens into the position shown in Fig. 2.

The notion once prevalent that the human eye is a perfect optical instrument has been long ago exploded; and the demands of our modern life, with all its complicated activities, constantly render the defects of this important organ more manifest. Of these defects, perhaps no single one is attended with more evil results than the refractive error known as astigmatism. Probably few persons outside of those professionally interested in defects of vision understand what astigmatism is. It may be briefly said to consist in the absence of a single, common focal point for the rays that come in different planes. Most frequently the cornea is at fault, being more strongly curved in one meridian than in others, the meridians of greatest and of least curvature being at right angles to each other.

But if the nature of astigmatism is not generally comprehended, its effects are obvious enough. Not only does it more or less seriously impair the vision, but it is a frequent cause of asthenopia, headache, and other forms of nervous trouble. It has been assigned as a cause of chorea, paralysis, and even of reflex disturbances in the digestive apparatus. It may well be doubted, therefore, whether any contrivance has ever been devised of more practical benefit than the cylindrical glass which corrects this affection.

Of course astigmatic persons do not experience the same benefit as others in the use of opera glasses, telescopes, etc., even if they wear the spectacles which correct the astigmatism. For this reason the recently patented device known as the Kornblum-Painter astigmatic eyepiece will be very highly appreciated.

Messrs. Tiffany & Co., of Union Square, after giving the invention a most careful test, have secured the sole right for the sale and manufacture in New York. The invention is applicable to opera and field glasses.



ASTIGMATIC EYEPIECE FOR OPERA GLASSES.

The Weight of a Cubic Inch of Water.

A cubic inch of distilled water, which forms the basis of our present imperial weights and measures, says *Industries*, was defined by act of Parliament in the reign of George IV to weigh 252.458 grains. Redeterminations of this ratio have since been made, proving that the experiments then conducted were not absolute, but that the weight of a cubic inch of water at the temperature of maximum density is equal to 252.286 standard grains. This alteration must necessarily affect the gallon and bushel and other derived measures, and we understand that the authorities at the Standards office have proposed to the president of the Board of Trade that steps shall forthwith be taken for readjusting the national measures. We hope that when the matter comes before the House the question of permanently altering our English measures to those of the metric system, which have now been introduced into use in most countries, will be discussed, and that the correction of this error will have some effect in simplifying our present complex system of weights and measures.

THE charred condition of the wooden coverings of the steam pipes recently exhumed by the New York Steam Power Company, in making way for the subways, after remaining for several years undisturbed, shows that even with such unfavorable surroundings as to moisture, etc., steam pipes are capable of actually burning wood. The question has often been discussed, but the evidence furnished in the case cited is very conclusive.

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RECENTLY PATENTED INVENTIONS.

Engineering.

VALVE GEAR. — Georg A. Franke, Muhlhausen, Prussia, Germany. This is a valve gear for steam engines, pumps, etc., in which there is no steam pressure upon the back of the slide valves, so that they may be considered to be balanced, and the lubricant may be supplied direct to the slide valve face, and the steam-tight valve chest covers, stuffing boxes, glands, and valve rods necessary in ordinary valve gears may be dispensed with.

CONDENSER. —Colcord Upton, Salem, Mass. This is a compound condenser more particularly designed for steam motors used for street car propulsion, the invention providing a simple and effective construction including various novel features and combinations of parts.

Railway Appliances.

PASSENGER RECORDER.—Addison C. Stone, Chicago, Ill. Combined with a paper-carrying roller and a clock mechanism connected to its shaft is a second shaft geared to the first one and carrying a spring, with means for winding it, and connections with each seat of the car and with a dial, whereby a record will be made of those entering and leaving the seats of a car.

COUPLING FOR CAR HEATERS.—Erwin S. Graver, Philadelphia, Pa. This is an improved pipe coupler for connecting the heating pipes of a train, the couplers being automatic in their action upon the backing of the cars together, and when there is any strain up and down or sidewise a sleeve and spring with which the coupler is provided are adapted to yield and permit the coupler to partake of the swaying motion.

Mechanical.

LUBRICATOR. — John A. Holmes, Salt Lake City, Utah Ter. This is a lubricator intended more particularly for supplying oil or other lubricant to relatively stationary bearings, such as pillow blocks and hangers of line shafting, etc., the invention providing a simple device by which any desired uniform feed may be maintained without waste.

BELT LACING NEEDLE. — Harvey Bosworth, Plattsburg, N. Y. This needle has an eye in its butt end and a reduced shank extending beyond the eye in the direction of the length of the needle, with an enlargement at its extremity, whereby, when the lace, cord or thread has been passed through the eye, it will be so attached that there will be no danger of its slipping from the eye.

HAT CROWN PRESS. — William J. Walker, Fishkill-on-the-Hudson, N. Y. This invention embraces a plug for pressing hat crowns, consisting of a flexible shell having the form of the crown to be moulded, with an inturned flange at its top, the flange and the upper portion of the shell being of greater thickness than the rest, with other novel features, making an inexpensive and effective press for moulding the crowns of all kinds of hats.

CASTING FLASK. — William Schumacher, Brooklyn, N. Y. This is a flask for casting ornaments, in which jewels of glass or stone are set in a manner to form a part of the mould face to be exposed to the molten metal, to not only impress the face of the jewels in the casting, but impart a luster to the casting at the points of its contact with the jewels.

Agricultural.

PLUNGER OPERATING MEANS FOR HAY PRESSES.—William A. Mayo, Paris, Texas. This invention covers an improved horse power designed to operate four or less hay presses by the movement of one operating lever, and to be also used for a great variety of other purposes, the construction being strong and simple while the weight and friction are greatly reduced, the efficiency and economy of operation of the device having been already strongly attested by practical users.

CORN PLANTER. — William Shortlo, Springfield, Ill. This invention covers a machine designed for planting corn and for check rowing, automatically-working drop levers being arranged to drop the corn at the proper distances apart as the machine is drawn along, and the invention covering various novel details and combinations of parts.

PLOW. — John U. Stephens, Point Peter, Ga. The point proper of this plow is formed of a triangular plate, the upper portion of which extends laterally to each side of the shank so as to admit the dirt or clay to fall back into the furrow, the invention being in the nature of combined plow and subsoil cultivator attachments, to be used on any ordinary plow stock.

THRESHING MACHINE. — Horace A. Wetsell, Tracy, Minn. Combined with a slotted table in the rear of the carrier is a series of shafts with beater arms working in the slots, an endless carrier below the beater, and a vibrating shoe, in front of which is a fan, the machine being designed to quickly and efficiently thrash all kinds of grain.

COTTON HARVESTER. — George P. Saltenberer, Lakeport, Ark. This invention relates to that class of harvesters in which an air blast is employed to force the ripe bolls of cotton upward into a receiving chamber, the invention covering various novel features of construction and combinations of parts.

TOBACCO HANGER.—Jordan F. Jones, Laurel, N. C. This invention is in that class of tobacco hangers generally designated "tobacco sticks," and consists of a bar with sharpened teeth attached to its opposite sides on which the tobacco leaves are strung and held suspended when the hanger is supported horizontally in the curing house or on racks in the field.

POTATO DIGGER.—John H. Priestley, Meriden, Iowa. This invention consists of a frame suitably mounted on wheels, carrying an adjustable scoop or digger at its front end, a sifting hopper being located within the frame, arms revolving in the hopper, a carrier to remove the potatoes to the bagging chamber, and an adjustable holder to support the bags while being filled.

PLOW. — Robert Weber, Sealy, Texas. This is a double mouldboard plow of simple and durable construction and capable of easy manipulation, wherein the point may be easily removed or replaced when necessary, the invention also providing means whereby the plow beam may be raised or lowered at will.

Miscellaneous.

CHURN DASHER. — Daniel A. Fiske, St. Louis, Mo. The main frame of this dasher has a central bar and parallel cross pieces, the staff being mortised into the center of the bar, the cross pieces being each beveled on their upper and under surfaces, so that when the dasher is forced down through the cream the bars deflect it outward, there being blades which also operate between the cross bars.

SHIELD.—Beaumont B. Buck, United States Army (Fort Douglas, Utah Ter.) This is a bullet proof shield to be made of steel or aluminum bronze, or other suitable material, in two or more parts or sections, and shaped to fit the body, or to protect only the chest and stomach if desired, when the shield may be made in a single piece.

BARREL HEAD HOLDER. — Alfred L. North and Halleck Howe, Patriot, Ind. This holder is preferably formed of a single piece of wire curved at its lower end to form an outer spring head clamp, the sides of which are curved in to bring its top closer to the sides, and curved at its upper end to form an inner retaining clamp, the holder being designed to hold the head of a barrel compactly and securely, so that it cannot get lost.

SIPHON BUNG. — George C. Peeling, Lock Haven, Pa. This bung has a driving face on top, a longitudinal bore to one side of which opens a valved air inlet passage, while an adjustable pipe extends through the bore and has a cock at its upper end, adapted to receive a hose for conveying the liquid to bottles or other suitable vessels.

RADIATOR. — John T. Breadner, Port Henry, N. Y. This invention relates to hot water radiators, and is designed to provide for an increased radiating surface without disturbing the induction and eduction pipes, the invention covering various novel features of construction and arrangement of parts.

HARMONIC KEY BOARD — John M. Smith, Leetonia, Pa. This is an attachment consisting of a set of false keys adapted to rest on top of the regular keys of an organ or piano, with longitudinally extending bars having projections adapted to engage the false keys, to permit the performer to play any desired chords without much study or practice.

PENCIL SHARPENER. — James T. and Hubert W. Morgan, Winsted, Conn. This sharpener has a conical cutting end having a stop for preventing the lead from projecting through the end of the sharpener, and a spring clasp for holding and guiding the pencil, while combined therewith is an eraser which also acts as a protector to the point of the sharpener.

LETTER PRESS. — Frank Casto, Cincinnati, Ohio. This invention provides a means whereby, after the follower has been carried downward as far as possible by the manipulation of the usual hand wheel or lever the follower may then be forced still farther downward by means of an extra lever, gear, and pinion.

STORE SERVICE APPARATUS.—Edward A. Rorke, Brooklyn, N. Y. This is a store service railway having a main track, a series of branch tracks and switches, and a series of carriers which are automatically switched to their particular station, different carriers being sent over the main line and on to branch lines by the automatic action of the carriers or different switches.

FIRE KINDLER. — Anton D. L. Gäthemann, Baltimore, Md. This kindler consists of a porous body with concave sides and a projecting stem or rod at one end with suitable fingers whereby the block may be suspended under the grate bars when used under a high grate, and form a support for the block when the latter is tilted on its side under a low grate.

COFFEE POT. — James S. Stidham, Floyd, Texas. Combined with this pot is a bag to contain the coffee, and one or more tubes for forming jets directed against the exterior of the bag, the invention being designed to facilitate the quicker and more thorough extraction of the aroma of the coffee and promote economy in its use.

GARMENT STAY.—Edward K. Warren, and Joseph H. Ames, Three Oaks, Mich. This invention covers a dress stay formed of a thin resilient blade and an ornamental fabric strip of greater width than the blade, the adjacent faces of the blade and strip being glued or cemented together, and the margins or selvedges of the strip being free from glue or cement.

HEATING DRUM —George E. Leonard, Farmington, Waupaca County, Wis. This is a tubular drum to be used as an upper section of a heating stove or as a section of a stove pipe, thereby giving greater heat-radiating surfaces and more fully utilizing the value of the fuel.

CHURN OPERATING MECHANISM.—Samuel A. Ott, Plover, Iowa. This invention provides means for imparting a rotary motion to a churn, and regulating such motion, the churn when in motion being elevated above the floor, and being conveniently let down without being detached from the frame.

TO PREVENT HORSES FROM CRIBBING. —Jacques Meyer, Paris, France. This is a device consisting of an expansible yoke formed with bearing faces, a strap arranged for connection with the yoke ends, and a means for connecting the strap with the head piece of a halter, whereby the throwing of the head forward by the horse will bring pressure to bear upon the windpipe and cause the horse to raise his head.

FEED BAG.—Charles R. Monfort, 212 St. Nicholas Avenue, New York City. This is a feed bag having also a storage compartment, and means whereby the grain or other food in the bag may be automatically fed in greater or less amounts as desired, the construction also providing for a circulation of air over the food, while the storage compartment may be folded in the feeding compartment when the bag is not in use.

HALTER.—John Gleiser, Manilla, Iowa. This halter has an improved link with metallic loops uniting the throat and jaw pieces through the medium of sliding rings, in combination with the straps forming such pieces, the check pieces and the fastener plates, the whole making a halter of durable and cheap construction.

DIVING APPARATUS. — Oliver Pelkey, Duluth, Minn. This is essentially a metallic body armor designed to have sufficient strength to resist external pressure while at the same time being of sufficient flexibility to permit the requisite movements of the diver, the invention covering various novel features of construction and a peculiar combination of parts.

LOCK. — Alfred C. Lawrence, Toronto, Ontario, Canada. This is a permutation lock designed more especially for money drawers at cashiers' desks, etc., to be operated only by authorized persons knowing the proper order in which the permutation levers or parts must be worked to allow the withdrawal of the bolt.

PHOTOGRAPHIC CAMERA. — Hervy Laney, Cumberland, Md. This is a camera for instantaneous pictures, in which the shutter is actuated by a spring mechanism with a rotary motion, and is held in check by a stop device, being intended to take a large number of instantaneous views without removing the negatives from the camera, the negatives being formed on a continuous roll.

SCIENTIFIC AMERICAN
BUILDING EDITION.

JANUARY NUMBER.—(No. 51.)

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
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Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1725) W. M. C. asks if a fish killed by an electric current would be eatable. A. Yes if fresh, but the shock is liable to induce early decomposition.

(1726) J. A. C. asks: Is there any positive evidence that the earth is getting cold and its crust getting thicker? After volcanoes have become cold or dead, do not some of them burn again? Are the large lakes getting shallow? Do astronomers claim that stars burn up? If so, how many do they know to have been destroyed in that way? What is the largest number of cubic inches of brain that any monkey has? What is the largest, also the smallest, number of cubic inches of brain that man has? A. There is nothing positive as evidence of the prehistoric condition of the earth and its crust. The geological succession of the strata form-

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ing the crust of the earth suggests the generally received theory of the gradual cooling of a former fluid globe. The volcanic and earthquake evolutions upon its surface now are suggestive of a thin crust resting upon a heated fluid center. Deep borings and mines also corroborate this view. Volcanoes have become active after many years of silence, and many volcanic cones and craters are known to have been silent during the historic period. Our large lakes have probably become somewhat shallower from geological changes as well as from drainage deposit of silt. Astronomers do not claim that stars burn up in the ordinary sense of the word, for there is nothing destroyed, but only the probability that collisions of suns, or suns and planets, or of suns with erratic bodies in space, produce vast outbursts of heat and light, which finally subside into the natural condition of a quiet body. There have been many outbursts of star light within historic times. Probably twenty have been observed. The human brain varies from 75 to 110 cubic inches. The brains of monkeys vary very much as the size of their bodies, probably 10 to 25 cubic inches.

(1727) C. H. asks: What is the composition of the fluid contained in the glass bottles called fire extinguishers, to be thrown on starting fires? And is the composition the same in the larger vessels intended to be carried on a man's back or transported in vehicle drawn by a horse? A. A number of formulæ exist. Bicarbonate of ammonia and bicarbonate of soda are excellent ingredients for liberating carbonic acid gas in large quantity, which tends to extinguish fire. To prevent freezing and to act as an agent that will retard combustion, sulphate of soda may be also used. The larger vessels you refer to are often charged with a solution of bicarbonate of soda. In use sulphuric acid is added by turning a handle which breaks or reverses a bottleful of the same. This forms sulphate of soda and liberates carbonic acid gas, whose pressure forces out the water in a jet when the loose faucet is turned.

(1728) T. E. P. asks: 1. What is the name of the poet, author of "Bachelor's Hall"? A. John Finley, of Cincinnati, Ohio. 2. A description of a dynamo for ten lights and how to construct it. A. See our SUPPLEMENT, No. 600, for an 8 light dynamo, which is the nearest to your requirements that we have published. 3. A receipt to make emery wheels. A. Turn out a wheel of wood, coat edge with glue, and roll it in ground emery. 4. How do they manufacture Bessemer steel? A. Cast iron is melted and run into converters, large vessels whose bottoms are perforated with holes through which a blast of air is blown. This bubbling through the melted iron burns out the carbon and silicon and raises the heat so as to make it very liquid. Finally some highly carbonized iron is run in and the product is withdrawn.

(1729) H. A. I. asks (1) if there is any substance that will stand the pressure of water at 300 feet deep on a fish net for floats better than cork or wood. A. Use hollow metal floats, made of heavy tin plate or brass. 2. About how much is the pressure to the square inch in fresh water at that depth? A. About 133 pounds.

(1730) "Archimedes" asks: What would happen if an irresistible force should come against an immovable substance? A. You assume an impossibility; nothing can be predicated as the result of an impossibility.

(1731) W. M.—To dissolve aluminate or silicate of potash, use boiling water, preferably under pressure. To produce a jelly like solid from two liquids, use chloride of calcium and sulphate of soda, both dissolved to saturation. Use four parts of sulphate of soda to one part of chloride of calcium (not chloride of lime).

(1732) J. N. H. writes: I have made some marble ornaments and tried to polish them with oxalic acid, but the polish is not at all satisfactory, and I think something else is used in connection with the acid. If so, will you inform me what it is, and how to be used so as to have satisfactory results? A. Marble polishing is quite a complicated process and is described at length in Workshop Receipts, 1st series, $2.50. You will probably find rubbing with hard pumice, followed by rouge and water on a linen cushion, and this followed by putty powder, sufficient. Use no acid.

(1733) U. S. R. and L. C. H.—The insects you complain of are the *Bayobia pratensis*, a small mite which occurs upon clover in great numbers through the summer and which sometimes enters houses during the fall. They can be killed with insect powder. Benzine is recommended, but of course involves very great risk of fire. They do no harm to clothing or carpets.

(1734) H. G. D. writes for a receipt for making a liquid and a non-liquid pad composition, such as printers and others use for putting paper up in pads or blocks. A. For non-liquid composition use strips of paper coated with postage stamp or other mucilage. For liquid use a solution of gutta percha in bisulphide of carbon, objectionable on account of the injury done by it to the operatives, or following glue composition: For fifty parts of dry glue weigh out nine parts of glycerine. Soak glue for 10 minutes or more, dissolve in water by heat, and add the glycerine. Color with aniline dissolved in a very little alcohol.

(1735) W. H. asks: Is there any explanation why a tuft of entirely white hair will appear in an otherwise full head of rich brown color, and is there a purely vegetable and harmless preparation for changing the defective color to brown? A. No explanation that really explains can be given. Use the juice of crushed black walnut husks to restore the color. Apply it with gloves on hands, as it stains the skin. The following is given as a formula for walnut dye for the hair: Green walnut hulls 4 ounces, claret wine 8 ounces.

(1736) J. G. Von H. writes: Not long ago I chanced to see a man called the "human volcano," performing with fire, blowing continually from his mouth a gas which ignited and appeared from its flame like ordinary illuminating gas. I noticed before he began with his gas performance he put something into his mouth (secretly) which looked like sponge, and after he concluded rubbed his mouth with a handkerchief in order to relieve himself of the substance undetected. Can you enlighten me what he used and how to prepare it? A. A short piece of lampblack is soaked in a solution of nitrate of potash and is dried. This is embedded in some tow and the end is lighted. If the whole is placed in the mouth, the performances you describe can be performed by breathing through it. When the combustion gets too active, the mouth may be closed and the piece of wick will prevent entire extinguishment, but the tow will cease burning.

(1737) H. S. asks: 1. Will a solid wrought iron ring in the place of wire wound ring do on armature of the simple electro-motor? A. The wire ring is preferable. 2. Will the field magnet be just as good, if made out of a solid piece of wrought iron in stead of sheet iron? A. Yes.

(1738) A. S. E. asks: 1. What is the name, popular and scientific, of the bark used in many kinds of dyeing? A. We presume you mean quercitron, the inner bark, according to some authorities, of the black oak (*Quercus nigra*), according to others of the yellow oak (*Q. infectoria* or *Q. tinctoria*). 2. A good yellow or amber dye, not containing annatto? A. Use turmeric or tungstic acid. 3. A method of detecting the bark in a dye? A. Test extract with (*a*) salts of iron, giving olive green precipitates passing into brown, (*b*) protochloride of tin, giving a yellowish red precipitate, (*c*) hydrochloric acid, giving reddish yellow precipitates. In a mixture such tests may fail, and its detection may be quite difficult.

(1739) G. B. M. asks for the material in which to cast silver. A. Use brass founder's sand and loam for moulds for casting metals at high heat. Where a very high heat is not needed, use a mixture of plaster of Paris 3 parts, fine brickdust or good pumice stone 1 part, mix to a paste with solution of alum, and when dry bake it. You will have some trouble in working with silver, as it absorbs oxygen and gives it off suddenly on cooling. The moulds can only be used once. We recommend Spretson's "Practical Treatise on Casting and Founding," $6.

(1740) F. W asks: 1. In winding a bobbin for an electro-magnet, does it make any difference whether the magnet wire is wound back and forth like a spool of common thread, or should the winding be all in one direction, viz., from left to right or right to left, carrying the wire back parallel to the axis? A. Bobbins are usually wound back and forth like a spool of thread. 2. In a steamer with 18 feet side wheels, 18×48 inches engine, 18 revolutions, steam 70 pounds and plenty of it, would it increase the speed of the boat to narrow down the paddles so that the engine would turn faster, say ½, or would the increase of power of the engine be lost in the increased slip of the wheels? A. Probably nothing could be gained by the change suggested.

(1741) H. D. asks why free burying grounds are called potter's fields, and where the name originated. A. We know of no earlier use of the name than in the Bible, Matthew xxvii. 7, where it is applied to a field south of Jerusalem, and which it is not unlikely might have been a place or neighborhood used for the work of the potter, thus originating the name.

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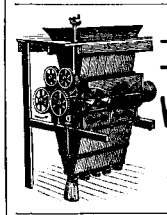
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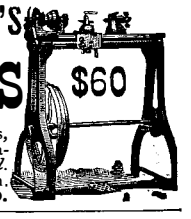

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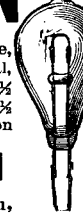
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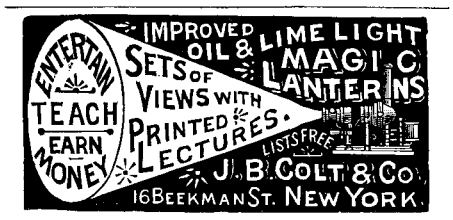

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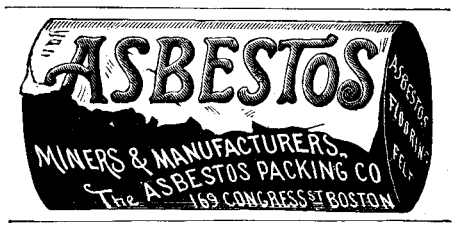

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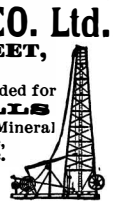

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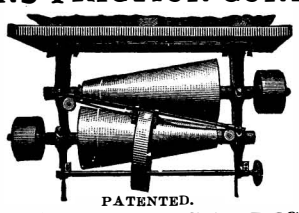

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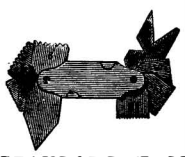

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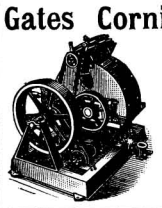

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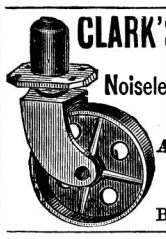

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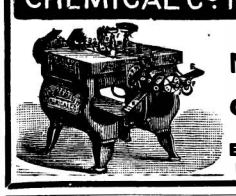

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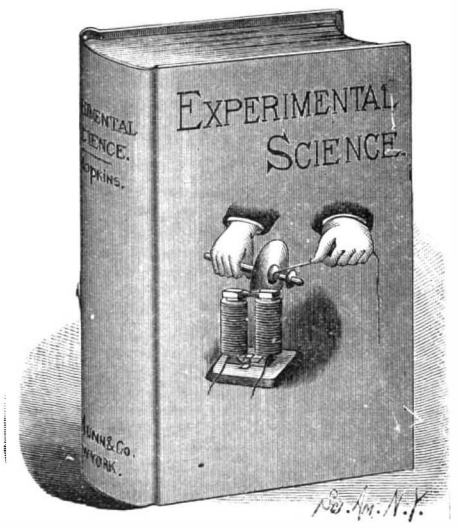

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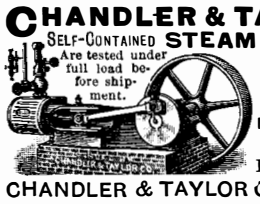

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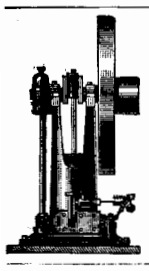

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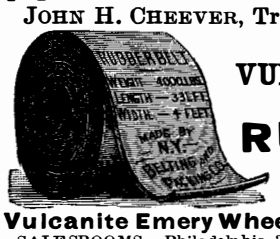

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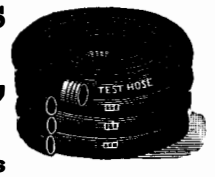

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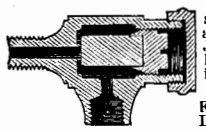

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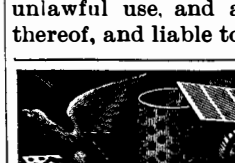

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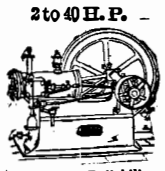

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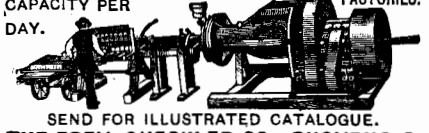

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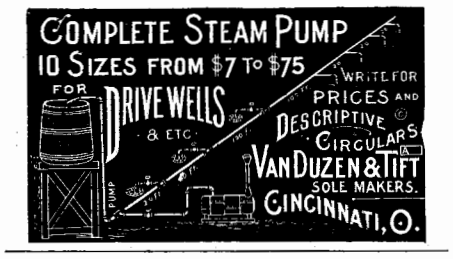

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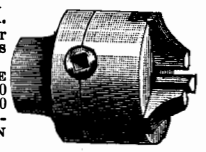

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